MARCH
1956
VOLUME 5
NUMBER 3

Battelle Technical Review

IN THIS ISSUE

Reactor - New Tool For Research

The metallurgist is placing a piece of material in a vacuum evaporator preparatory to coating it with metal. This equipment, housed at Battelle's Geneva laboratories, is used when putting metal films on materials that cannot be heated. The metal jar, seen at the top of the photo, is fitted over the equipment and the coating process is thus accomplished under high-vacuum conditions.

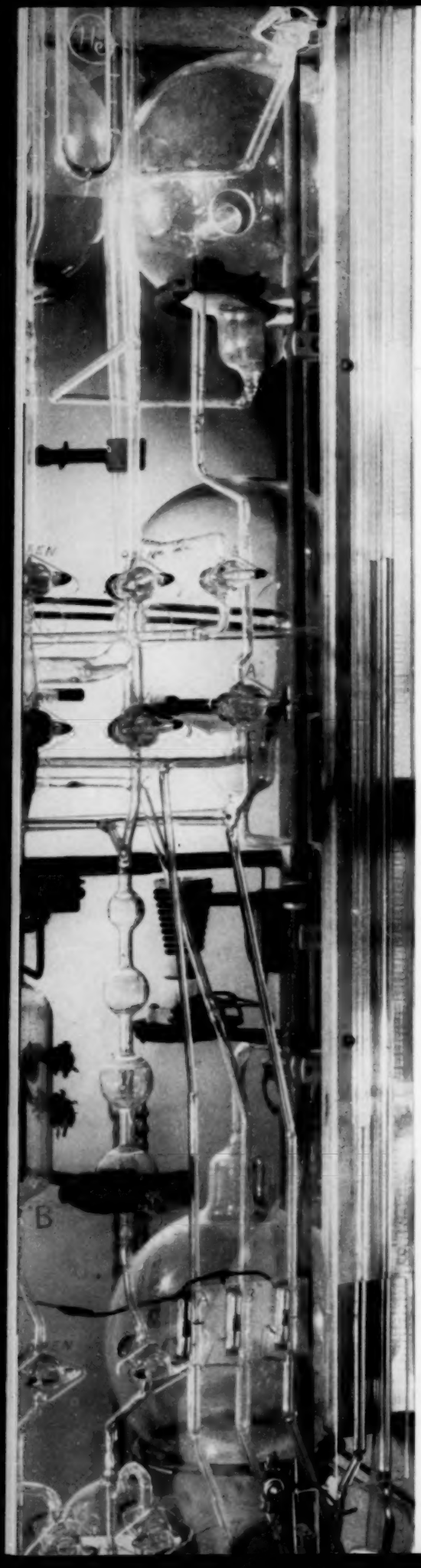
VACUUM EVAPORATOR

Volume 5, Number 3
March 1956

BATTELLE TECHNICAL REVIEW

Dedicated to the dissemination of knowledge. Published monthly by Battelle Memorial Institute, an endowed foundation serving mankind through science and technology.

Published monthly by Battelle Memorial Institute. Please address all correspondence about articles, abstracts, subscriptions and exchanges to: The Editor, Battelle Technical Review, Battelle Memorial Institute, 505 King Avenue, Columbus 1, Ohio. Accepted as controlled circulation publication at Columbus, Ohio. Printed in the U. S. A.



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Adsorption apparatus used to determine surface area, porosity, and adsorption characteristics of solids.

A New Look at Natural Resources

NATURAL RESOURCES—MINERALS, fertile soil, and other environmental bounties—are often cited as a primary reason for a nation's prosperity. Conversely, economic backwardness is frequently attributed to a lack of natural resources.

While natural resources are important, there is ample evidence to show that they alone cannot explain a nation's economic health, or lack of it. England, Germany, Denmark, Belgium, Holland, and Switzerland have been living testimonials to this for generations. None of these countries has natural resources as abundant as those of many Asiatic, African, or South American countries, yet they have enjoyed relatively high standards of living. Also, the United States and Canada, although possessing rich natural resources and having high living standards, do not have the abundance of natural wealth found in several of the world's less developed nations.

The inevitable conclusion is that the energy of a nation's people, their social mores, and their cultural background are also resources—just as important as natural resources for a nation's welfare. Thus the productive qualities of the English people—or the Swiss, Dutch, Belgians, and others—coupled with their social mores, have enabled them to overcome relative sparsities in mineral and land wealth. These intangible factors, then, are tantamount to natural resources in a nation's economy.

By the same token, science and technology, since they are part of the culture of a people and are responsible for productive skill, are also "natural resources". The research laboratory, thus, is a mine from which unlimited natural wealth may be extracted. The very act of conducting applied research is an act of creation, whereby values important to a nation's prosperity are shaped and formed.

Science and technology not only give a nation productive skill, but they also extend and increase natural bounties. They make low-grade minerals valuable, and they make nonfertile soil just as productive as high-fertility soil. They additionally give value to geological formations without pre-existing values. For instance, bauxite a century ago was virtually worthless, while today it is the basis of the aluminum industry.

Technology also gives new values to such natural assets as geographic location and climate. The Swiss Alps, southern France, and Italy have become more important as vacation spots as technological advance has given people more leisure and better means of travel. And the desert regions of southwestern United States have become highly productive agricultural areas with the development of irrigation and fast transport.

All nations, wherever located, have some resources—in terms of environmental assets and human abilities—that are needed in world commerce. A challenge for science and technology is to uncover these, and thus hasten the day when the peoples of the world can live in greater prosperity, security, and friendship.

Clyde Williams

President and Director,
Battelle Memorial Institute

VIGNETTE

ENERGY TECHNOLOGIST

HARLAN W. NELSON

Meeting the expanding energy needs of industry calls for our best research effort in every field related to the problem. Harlan W. Nelson, Battelle technologist in the field of fuels and energy, points out that the energy field is complicated by new sources now becoming available. Careful study of energy economics is necessary, he believes, if American industry is to utilize available energy sources to the best advantage both technically and economically. Such studies can help determine the best energy sources and methods of use, based on specific needs.

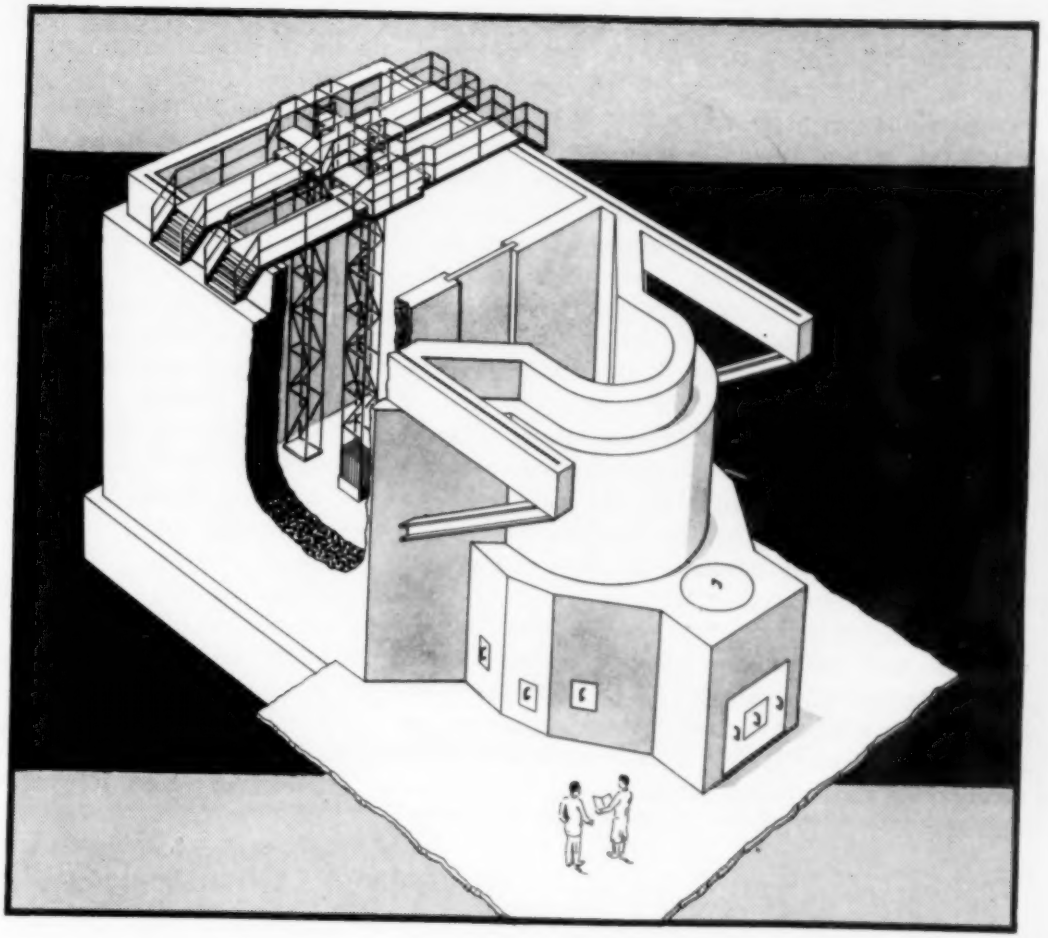
Fuels and energy problems have been a long-time concern of Harlan's. After receiving a Ph.D in chemical engineering from the University of Illinois, he joined Pennsylvania State University. There he was professor in the department of fuels technology and divided his time between teaching and the Mineral Industries Experiment Station at the University. He joined Battelle in 1944 where he has continued his studies of fuels problems.

During his years at the Institute, Harlan has participated in and directed fuels studies on a broad front. His research activities have been related to such problems as the development of automatic residential stokers, gas-fired incinerators, and gas and oil residential heating equipment; the study of a pressurized gas producer; gasification of coal; the investigation of the nature of effluents from incinerators; the carbonization of coal; and coal utilization.

His more recent responsibilities reflect the growing importance of the economic aspects of fuels utilization. He is engaged in engineering economics studies of fuel and energy resources, which include consideration of economic problems related to the use of nuclear energy sources. More than 40 publications reflect the various facets of his technical activities.

In addition to his responsibilities at the Institute, Harlan is active in professional societies. Recently, he became chairman of the Gas and Fuel Chemistry Division of the American Chemical Society. He also holds membership in the American Society of Mechanical Engineers and the American Coke and Coal Chemicals Institute.

A father of three, the youngest 12-year-old twins, Harlan finds time to indulge his interest in photography and to enjoy his well-equipped workshop.



This cutaway drawing shows how the Battelle research reactor will look when it begins operating soon. The reactor core is suspended from the bridge on the right; the bridge on the left is for instruments and large specimens. When the gate is removed, the core may be moved against the thermal column on the right.

Reactor -- New Tool for Research

Research reactors have opened new vistas in technology. Here is a report on opportunities and problems they present to industry.

by JOEL W. CHASTAIN, JR.

THE NUCLEAR REACTOR, popularly considered primarily a source of power, has been an important research tool from the earliest days of atomic energy. In recent years, reactors for research purposes only have become available, although their operation has been confined to government laboratories. Within the last year, however, research institutions, universities, and industries have begun construction or serious planning of research reactor facilities. There are several reasons for this increased interest. The recent revision of the Atomic Energy Act makes it easier for private organizations to construct and operate reactors and to benefit financially from inventions associated with their use. Also, a relatively liberal supply of uranium-235, at reasonable cost, is available for use as fuel. These factors have also increased the interest in nuclear power, which, in turn, increases the need for research reactors to test materials and to make physics measurements.

In addition, a great deal of work is being done by a number of firms to simplify the design and, hence, to reduce the cost of research reactors. The biggest factor, however, in this growing interest, is the realization by industry of the tremendous usefulness and versatility of the reactor as a tool for research. Because of all these favorable conditions, reactors are likely to be used much more widely in the near future.

Research reactors are useful primarily for providing

intense beams of neutrons and gamma rays. These radiations are produced in the nuclear process known as fission. In the most common type of fission, a thermal neutron (a neutron of relatively low velocity) is absorbed by a uranium-235 atom which then splits into two almost equal parts. These parts or fission fragments carry off about 160 million electron volts (mev) of kinetic energy which appears as heat to be carried away in the coolant. The fission fragments later decay to stable products by emitting beta particles (electrons) with a total kinetic energy of 5 mev and gamma radiation totaling 6 mev. In addition to the fission fragments, 6 mev of gamma rays and an average of 2.5 neutrons are released at the moment of fission. The neutrons are emitted at high energies and are "slowed down" by successive collisions with surrounding nuclei to thermal energies where they may be absorbed by uranium-235, thus propagating the fission reaction.

In a research reactor, the fast neutrons, thermal neutrons, and gamma rays are used for purposes of study. The fission fragments and the electrons travel such a short distance in most materials that they are not generally used. Their energy is dissipated in the neighboring matter and removed as heat by the cooling fluid.

Reactor Mechanics

The fission process occurs in the part of the reactor called the core. The core contains the reactor fuel which may be used in the form of thin plates or rods or may be a solution. Besides the uranium fuel, the core contains the moderator which is a material used for "slowing down" or moderating the fast neutrons to thermal energies. A moderator must be a light material and must absorb very few neutrons. The most common moderators are water, graphite, and beryllium.

Surrounding the core is the reflector which scatters escaping neutrons back into the core thus reducing the neutron leakage from the core. The reflector permits a smaller size core for a given fuel and moderator mixture than would be possible for a core with no reflector. In addition, the reflector keeps a high, useful neutron concentration over a greater total volume. This is advantageous in a research reactor. A good reflector material should absorb few neutrons while scattering many. Thus, it has properties somewhat similar to a good moderator and the most used materials are again water, graphite, and beryllium.

The reflector, in turn, is surrounded by the shield which protects personnel and instruments from the radiations. The shield must attenuate both the neutrons and gammas. Neutrons, after being reduced to thermal energies, are readily absorbed by materials such as boron and cadmium. Gamma rays are attenuated best by dense materials such as iron, lead, and bismuth. One shielding material whose properties approximate all these requirements is concrete, particularly some of the dense mixes which contain baryte ore as the aggregate. The hydrogen in the water retained in the concrete slows down the neutrons so that the other elements in the concrete may absorb them. The density of concrete, while not as great as that of the metals mentioned, is sufficient to stop the gamma rays if it is used in reasonable thicknesses. Concrete has the further advantage of being comparatively cheap and, consequently, is the most frequently used shielding material.

During operation, the core and the reflector of a reactor are densely populated by neutrons flying in all directions with a wide range of velocities. The intensity of this hail of neutrons is measured by a quantity called the neutron flux which is the product of the neutron density times an average velocity associated with the neutrons. This so-called flux is usually expressed in neutrons/(cm^2) (sec). The average research reactor today has a maximum flux of between 10^{10} and 10^{13} neutrons/(cm^2) (sec). Since the power of the reactor is proportional to the product of the flux and the fuel loading, it is advantageous to keep the critical fuel mass as low as possible in order to obtain the maximum flux for a given power.

The gamma radiation is generally measured in roentgens/hr although it can be expressed as gammas/(cm^2) (sec). The gamma intensity in the core is proportional to the power divided by the core volume. Hence, it is beneficial to keep this volume as small as possible. The average sized research reactor

Joel Chastain's professional activities have been associated with the solution of nuclear problems. After working with the Case Institute of Technology betatron for several years, he undertook nuclear reactor studies at Battelle. His investigations have included problems in reactor physics, heat transfer, thermal stresses, and reactor-core design. He aided in the design of both the Institute's research reactor and critical assembly laboratory and shares important responsibilities in the establishment and administration of those facilities. After receiving his B.S. in physics from Kent State University, he carried on graduate work at Case Institute of Technology after receiving an M.S. in physics there.

TYPICAL NON-AEC RESEARCH REACTORS

Sponsor	PLANNED COMPLETION Date	Megawatts	Type
American Machine and Foundry Group	1956	1.0	Swimming Pool
Armour Research Foundation	1956	0.05	Water Boiler
Battelle Institute	1956	1.0	Swimming Pool
Gamma Corporation	1956	0.5-1.0	Water Boiler
Massachusetts Institute of Technology	1957	—	Closed Tank D_2O
Michigan, University of	1956	1.0	Swimming Pool
North Carolina State University	Operating	0.01	Water Boiler
Pennsylvania State University	Operating	0.1	Swimming Pool

operating at 1 megawatt has a flux of 6 x 10^{13} gammas/cm^2) (sec) or about 2 x 10^8 roentgens/hr.

The maximum fluxes of fast neutrons, thermal neutrons, and gammas usually occur at the center of the core but are fairly uniform inside the core. (See the graph on page 7.) Going out radially, the fast neutron flux drops off most rapidly since the fast neutrons are slowed down to form thermal neutrons. Relatively little fast flux is found in the shield. The thermal flux also drops off away from the center, but peaks up some in the reflector because of moderation of fast neutrons to thermal neutrons.

In the utilization of these fluxes, every effort is made to get close to and sometimes into the core. Of course, by changing the location of the specimen in the reactor, the ratios of the radiations received can be varied. To obtain one radiation relatively free of the other, filters or a combination of filters can be used. For instance, a can of paraffin with cadmium ends can be used to eliminate both fast and thermal neutrons. This leaves a clean beam of gammas. The cadmium absorbs the thermal neutrons and the paraffin slows down the fast neutrons to thermal energies where they, in turn, can be captured by the cadmium. To obtain thermal neutrons, a column of graphite, called a thermal column, is used. The graphite absorbs very few thermal neutrons but very effectively reduces the fast neutrons to thermal energies. A lead or bismuth slab is used in conjunction with the thermal column to cut out the gamma rays.

Types of Research Reactors

Research reactors can be classified into two main groups; those which use enriched uranium and those which use natural uranium as fuel. The former can be further broken down into fluid-fuel reactors and solid-fuel reactors.

Natural uranium reactors are characterized by large size, a high fuel requirement, and the use of either graphite or heavy water as moderators. These characteristics result in a high cost per unit of flux, particularly in the case of the graphite moderated-assemblies. The typical core size is a 25 ft. cube and requires 500 tons of graphite and 40 tons of natural uranium. Such a reactor, operating at 25,000 kw would produce a maximum thermal flux of 4 x 10^{12}. Because of the size and cost, it seems improbable that reactors of this type will be built in the future in this country.

The natural-uranium heavy-water moderated reactor has been used most extensively abroad where heavy

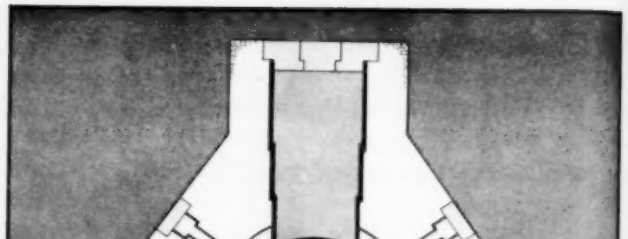
water is available and enriched uranium is not. The use of heavy water, which is a better moderating medium than graphite, substantially reduces the size and the fuel requirements of these reactors. The NRX reactor in Canada contains about 10 tons of uranium and has core dimensions on the order of 6 to 8 ft. When operating at 40,000 kw, this reactor produces a maximum thermal flux of 7×10^{13}, which is second only to the Materials Testing Reactor in Idaho. However, the availability of enriched uranium makes it possible to build still smaller and cheaper reactors for research purposes.

The first research reactors utilizing enriched fuel were the reactors called "water-boilers", which use an aqueous solution of either uranyl sulfate or nitrate as fuel. The core consists of a stainless steel sphere about 1 ft. in diameter which contains the fuel solution. The heat is removed by a cooling coil which is wound through the inside of the sphere. The advantage of these reactors is the high flux which is available at low power operation. A typical water boiler has a critical mass of 0.8 kg. and a flux of 10^{12} at a power of only 30 kw. There are many disadvantages to this type reactor. First, the power is limited to about 30 kw, or 2.5 kw/liter of core volume, because at higher power densities, the water dissociates too rapidly and the uranium solution tends to become unstable. Second, a system must be provided to recombine the hydrogen and oxygen. All of the plumbing must be absolutely leak tight because of the intense radioactivity of the solution. It is also true that the region of high flux available for experimentation is limited to a rather small volume.

Based on the high fluxes attainable and the low cost per unit flux, the enriched uranium solid-fuel type reactor is the best reactor thus far developed for research work. There are two basic subdivisions of this type of reactor. In the first type the core operates in an open pool of water while in the other the core is contained in a closed tank of water.

Pool Type Reactor

In the pool type reactor, shown on page 3, the core is suspended some 20 ft. below the water level from a traveling bridge. The bridge can be moved by a hand-driven wheel from one end of the pool to the other on crane rails located on the top of the pool wall. The fuel assemblies most commonly used are made up of plates about 3 in. wide, 0.060 in. thick, and 24 in. long. The plates are of sandwich construction containing a 0.020 in. thick uranium-aluminum alloy with a 0.020 in. thick cladding of 2S aluminum on each side. After fabrication some 10 to 18 of the plates



The sketch illustrates the arrangement of the thermal column in the Battelle reactor. The presence of graphite permits delivery to the reactor room of a stream of thermal neutrons. By means of the beam tubes, it is possible to utilize almost every type of radiation produced by the reactor.

are slipped into slotted side plates to form a box-like subassembly about 3 in. square and 24 in. long. A cylindrical piece welded to the bottom of the assemblies fits into holes in a grid plate which supports them in an upright position. A useful experimental loading may require from 25 to 30 assemblies depending on the U-Al alloy composition. At powers up to 300 or 400 kw, the reactors can be cooled by natural convection. Higher powers require forced cooling to insure that no boiling occurs and to reduce the rise of radioactive gases to the pool surface.

The pool reactors are attractive because of their extreme flexibility since the core can be changed to some new configuration quite easily. In addition, the core can be operated in several positions in the pool which, in most reactors, is divided into two parts by a removable gate. In the more recent designs, one part of the pool is a stall formed in the concrete into which the beam tubes and thermal column converge. This permits the core to operate very close to these experimental facilities and, hence, obtain the highest possible fluxes. For large experimental set-ups such as bulk shielding or engineering loop studies, the second part of the pool can be drained and with the reactor in the other side, the equipment can be installed on the pool floor. The pool can be refilled, the gate removed, and the core run through the opening and up against the experiment.

Powers as high as 1000 kw are planned presently for pool reactors. The critical masses run about 3 kg and the fluxes approach 10^{13} for the 1000 kw operation. The reactors probably can be operated quite safely at 2 or 2.5 mw but fluxes much above 10^{13} make a tank type reactor almost essential.

The tank type reactor uses much less water than the pool type and, consequently, more concrete is needed for shielding. The core is immovable and the containing tank is tightly closed. These reactors are considerably more expensive and less flexible than the pool type because of the tank and all the piping and control rods which must penetrate the tank. Although a number of these reactors have been built using light water, the tank type reactor, because of its smaller water volume, can make use of heavy water as moderator at fairly reasonable cost. Because heavy water is a better moderator than graphite and absorbs fewer neutrons than light water, the critical mass can be considerably reduced. In fact, the use of heavy water will roughly double the available thermal flux for a given power over that obtainable from a similar reactor using light water. The heavy water reactor is also somewhat safer because the lifetime of a neutron is longer in heavy water. This causes slower response to changes in power level. Of course, the initial cost of such a reactor is high because of the cost of the heavy water and the plumbing complications necessary to avoid loss of the heavy water. About one million dollars worth of heavy water would be needed for the average tank reactor.

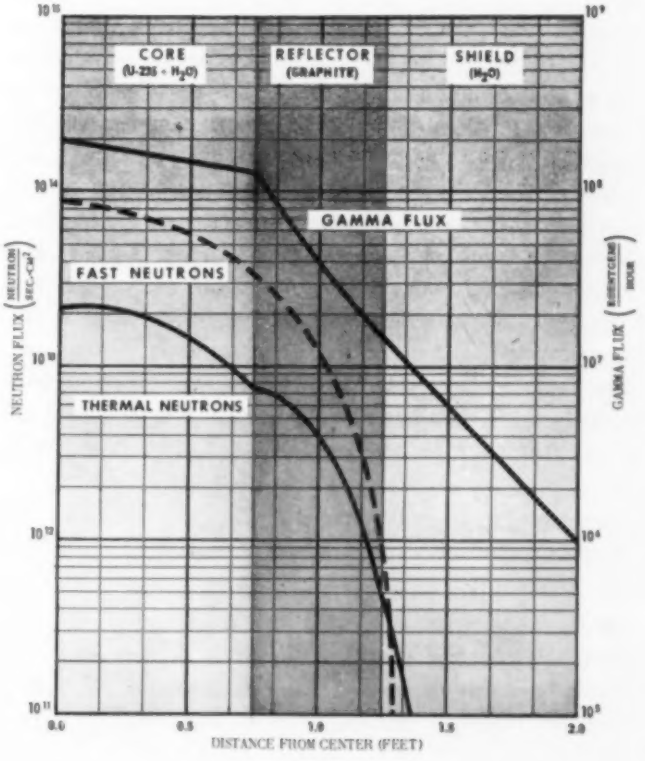
Methods of Irradiating Specimens

Mechanically, one of the principal problems in the design of research reactors is to provide effective methods for making their radiations available. The irradiation of materials is one of the primary purposes of the reactors, and a number of different systems have been developed for exposing specimens to the gamma and neutron fluxes. The most common and frequently used system employs beam tubes. These are tubes or lined openings which pass through the concrete shield into the reflector or the core of the reactor. Both horizontal and vertical beam tubes are used. Intense beams of neutrons can be brought out through the tubes for experimentation, or materials may be inserted into the tubes for irradiation. The number and size of the beam holes vary but most reactors have from 4 to 16 with 6 in. and 8 in. diameters being the most popular. Of course, 10 in. and 12 in. diameters and even larger sizes are used.

Probably the second most common facility for doing reactor research is the thermal column which was mentioned previously. This is a device for providing large quantities of almost pure thermal neutrons. The thermal neutrons are used in a variety of experiments such as activation analysis and measurement of physics parameters which will be described later. Another commonly used method for exposing materials is the so-called "rabbit tubes". In this method of irradiation a small encapsulated specimen can be shot rapidly, by pneumatic or hydraulic means, through a small tube into a region of high flux. Because of the speed of the method, it is particularly useful in preparing short-lived radioactive materials. It also provides a method of removing a specimen without shutting down the reactor.

Two other methods applicable mostly to the pool type reactor should be mentioned. Experiments can be placed in hollow aluminum boxes of the same size and design as the fuel element and inserted in the grid plate against or even in the core. This permits the utilization of the highest possible flux. In most pool reactors, a second bridge structure identical to the one supporting the core is used to suspend shelves for instruments or specimens. With the two bridges run together, a specimen on one of the shelves suspended from the instrument bridge would receive very intense radiation. Large experiments can also be handled in a pool reactor in the open part of the pool as previously described.

TYPICAL FLUX DISTRIBUTIONS



Areas of Radiation Research

Probably the most spectacular and closely followed use of radiation has been in medicine, particularly in the treatment of tumors and cancers. Research reactors are helpful in this field because they can produce radioactive isotopes of high intensity at comparatively moderate cost. Such isotopes are used in the field of medicine in the same way as radium but because of the reduced cost can be used more widely.

For years, medical men have been handicapped in treating internal cancers because of surface burns that often result from the use of present methods of irradiation. Such burns occur because, to obtain a useful intensity on an internal cancer, the dose must be high enough to allow for adsorption in the intervening tissue. To prevent burns, it is often necessary to reduce the dose to the affected part.

Very important advances toward using reactor radiations in the treatment of cancers are being made. One of the most interesting of these, neutron therapy, has been reported by C. S. Shoup of Oak Ridge and L. E. Farr of Brookhaven National Laboratory. The effectiveness of the treatment is based upon two characteristics of neutrons: (1) they produce little ionization and can pass through tissue with relatively little effect; and (2) they interact with boron to produce alpha particles which cause intense ionization in the area where they are located.

In this new method, a solution of the isotope boron-10 is injected into the blood stream. The breakdown of what is termed the blood-brain barrier in the cancer causes absorption of boron to take place most readily there. In the short time interval in which the boron is confined mainly to the cancer, the affected tissue is irradiated in a beam of thermal neutrons. The alpha particles produced from the boron-neutron reaction are very destructive to the cancerous material in which they are produced. However, because of their short path length, the alphas do not penetrate into the healthy tissue, which makes possible very selective treatment. At present, the short residence time of the boron in the cancer makes high neutron fluxes necessary to create effective dosages, which is a disadvantage. A satisfactory solution for this problem requires further research.

Research in Biology

In the field of biology, scientists hope to speed up the development of desirable new strains of plants and animals. Much of practical genetics in breeding desirable strains—i.e. disease resistant plants or broad breasted turkeys—depends upon mutations. (Mutations are those sudden and random changes in characteristics that occasionally appear in an individual.) Most mutations are undesirable, but careful selection and interbreeding can develop many of the desirable characteristics that appear. Through the use of nuclear irradiation the mutation rate of plants and animals can be greatly increased. This in turn, provides the biologist with a greater number of mutations from which he may make selections.

The fact that radiation can kill living organisms makes possible the use of radiation in the sterilization and pasteurization of foods and drugs. Actually, only the gamma rays are used and the neutrons must be filtered out of the reactor beam since their use would induce radioactivity in the product. In theory, any food or drug can be sterilized by radiation, although in some cases large doses may be required. However, complete sterilization of some foods has not been entirely successful because of harmful effects to their flavor and odor. Several methods of controlling these side effects are being studied: irradiation in the frozen state, the addition of free radical acceptors, and irradiation in a vacuum or inert gas.

The sterilization of bandages, surgical tools, and pharmaceuticals and biologicals is being used commercially. In some cases, vaccines and antibiotics are temperature sensitive and, consequently, radiation is the only method of sterilization.

Pasteurization, which decreases, but does not eliminate bacteria, seems feasible now for many meats and foods. For instance, the storage life of pork chops has been increased five-fold over unirradiated chops. The lower dosages have been found useful in slowing down the sprouting of potatoes and in inhibiting the growth of trichinella-spiralis in pork and weevils in grain.

Research in Chemical Field

In the chemical field, a considerable amount of research has been devoted to the study of radiation-induced reactions. Probably two of the most promising fields have been the use of neutrons and gammas in polymerization and catalytic reactions. These radiations have been shown to accelerate some reactions and even to induce some which are not otherwise possible. Polyethylene, for instance, can be produced at lower temperatures and pressures in a radiation field than would be possible without the ionizing medium. It also appears that polyethylene so produced may have better mechanical properties.

As a catalyst in the petroleum field, the use of radiation alone or with thermal effects may prove very valuable. At present, considerable research is in prog-

ress to determine the effect of gamma ray energy in the "cracking" process. As reactors become available, this work will undoubtedly be duplicated with neutrons and gamma rays. It may be that the free radicals induced into the specimen are the important things and the type of ionizing particle is important only from the standpoint of the specific ionization which it will produce. Consequently, a method for absorbing the entire energy of fission, including that of the short-range fission fragments in the petroleum specimen, has been tried by at least one experimenter. The proposed method consists of making a slurry of very finely divided uranium-235 in the petroleum. This slurry is then encapsulated and placed in the reactor. The fissions induced in the uranium by the neutron flux take place in the specimen. Thus, almost 100 per cent of the fission energy causes ionization in the material of interest.

In recent years, a large number of polymerization reactions have been initiated by radiation. Among these are ethylene, silicones, polyesters, vinyl acetate, and vjnyl ethers. Actually, the polymers formed by this method may have a slightly higher melting point and density but are, in general, not significantly different from the ordinary types. However, the use of radiation offers a way of making materials for medical work free from catalyst fragments and hence of high purity.

There are other radiation effects which are of interest. These relate to the damage caused to materials used in the high flux region of power reactors. The damage may be embrittlement, changes in thermal conductivity, changes in density, etc. Additionally, corrosion of structural material by the coolant may be greatly accelerated by these physical changes. The cooling medium, itself, may dissociate or suffer other damage. Although the final tests will still have to be done in the highest possible fluxes, such as those available in the Materials Testing Reactor (4×10^{14} neutron/cm^2) (sec), screening type tests are possible in pool reactors with a flux of 10^{13}. The pool type reactor has one advantage in that a rather large scale loop made of the material to be investigated may be operated close to the reactor core. The loop could have forced circulation of the coolant at operating temperature and pressure. The field of radiation damage is relatively unexplored and will require much investigation as the number of power reactors increases and their operating conditions become more severe.

For certain elements that become radioactive under neutron bombardment, activation analysis provides a very sensitive analytical tool. This method of analysis was first used by G. T. Seaborg and J. J. Livingood in 1938 to detect small amounts of gallium in gold. With the higher thermal neutron fluxes now available from reactors, the method can be applied to materials which absorb neutrons less readily. The work of C. A. Tobias and R. W. Dunn illustrates the sensitivity of the method. They measured the amount of gold which remained in different tissues of a mouse 30 days after 100 micrograms of gold had been injected. The sensitivity was such that the amount remaining in the gall bladder was determined to be 10^{-12} grams. Tobias and Dunn also measured the amount of gold present in the white cells of the total blood of a leukemia patient by irradiating only a few milligrams of blood ash. In certain favorable cases where the impurity has an easily produced distinct decay scheme, impurities down to 1 part per billion can be measured. A specific example of this is iridium in platinum.

Neutrons, because of their wave properties, can be diffracted in the same way as X-rays. This neutron diffraction supplies a method of solving crystal structure problems that supplements X-ray methods.

Neutron diffraction is most advantageously used in the field of organic and magnetic crystals. X-rays are diffracted very weakly by hydrogen and the heavy materials present may completely mask the hydrogen scattering. With neutrons, the coherent components from hydrogen are of the same order of magnitude as those from other elements. This provides a method of detecting and locating hydrogen in crystal structures. Neutrons are also useful in studying samples which contain elements close together in atomic number such as Fe-Co alloys. Since X-ray diffraction intensities depend upon scattering from electrons, they would be quite similar for iron and cobalt. On the other hand, neutron diffraction intensities depend upon scattering from nuclei and hence would be quite different.

Neutrons, because of their magnetic moment, are scattered selectively by magnetic atoms. This permits more detailed study of magnetic crystals than is possible with X-rays. The use of neutrons in the study of ferromagnetic and antiferromagnetic crystals is of particular use to the electronics industry which is finding new uses daily for these materials.

An important use of reactor radiation is the production of radioisotopes for research in physics, medicine, biology, and chemistry. A large number of the longer lived isotopes are available for purchase from the AEC. For experiments requiring the very short-lived materials, the work must be taken to the reactor.

The determination of various parameters for use in the design of other reactors is another use for research reactors. Of prime importance is the measurement of the cross section or the probability of occurrence of a nuclear reaction in various materials. The reactivity of fuel elements and the nuclear properties of various uranium lattices can be determined through the use of the research reactor. Also, shielding materials and configurations can be mocked up and tested.

This article has only touched on the uses and anticipated uses of reactors. The need for radiations will undoubtedly "snowball" as new discoveries are made. The choice of the reactors built to fulfill these needs will depend on the requirements with respect to flux, cost, safety, and versatility.

Organization for Effective Reactor Use

The preceding discussion has attempted to describe the operation and uses of research reactors. But no account would be complete without a discussion of the organization required for really effective utilization of such a research tool.

The reactor itself needs an extensive staff to supervise and carry out the various activities required to operate it. Thus, an operating reactor calls for the services of metallurgists or ceramists to prepare radiation specimens. Laboratories and specially trained people are needed to encapsulate specimens that are to be irradiated at high pressures and temperatures. Moreover, special handling techniques and hot laboratories must be available for post-irradiation analysis. In addition, an experimental shop is a necessity to modify standard machine tools and to design and manufacture novel devices for the remote machining, handling, or examination of specimens.

The carrying on of studies in any field, of course, calls for the presence of a research staff. In many, perhaps most, cases, work with the reactor will be only a part of a research program. For example, a project involving the use of radiation as a catalyst in some chemical reaction might be only part of a study of a number of catalytic possibilities, all of which would be the responsibility of a group of chemists or chemical engineers.

In addition, reactor specialists would advise on the design of safe experiments in the reactor. Health physicists should be available to insure there are no radiation hazards to the experimenters or others working at the reactor. Physicists might serve as consultants to assure the most effective use of the radiation, and hot-cell specialists would aid in post-irradiation studies. Thus, a tremendous amount of backup and cooperative effort is necessary in the operation of a research reactor. Obviously the economic operation of such a facility calls for carefully planned and continuous research programming.

SCIENCE CLOSELY PURSUED

"It took many decades after the discovery of the basic principles of electromagnetism before it found its real applications in the electric motor and later in radio. But we are about to generate useful amounts of power from atomic energy only some 15 years after its discovery. There are those who still doubt the practicability of atomic energy, but I ask you to consider the state of development of Watt's steam engine 15 years after its invention. In fact, the application of science follows so closely on discovery that some have begun to worry about our basic knowledge. Industry is breathing down the neck of the scientist."

B. D. Thomas

Improving Diffusion Flames

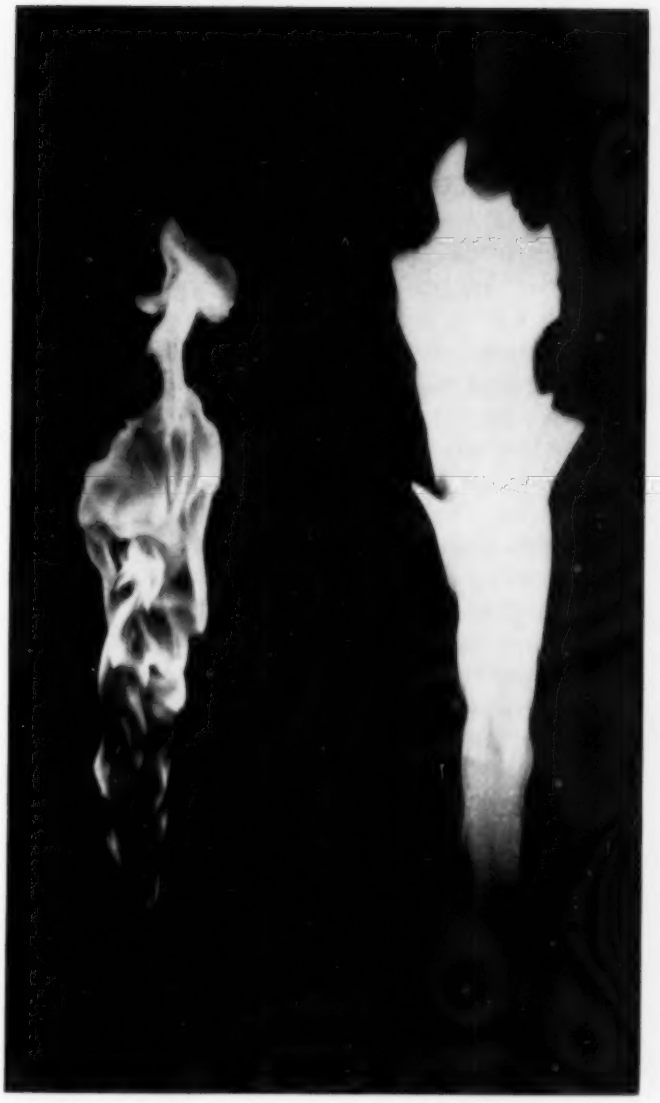
by ABBOTT A. PUTNAM

Combustion scientists are using new methods to increase the efficiency of one of man's oldest energy sources—the diffusion flame.

AN IMPORTANT PART OF industrial technology, and thus a significant economic factor, is the use of the combustion process for producing heat, creating special atmospheres, or disposing of waste. However, because a flame is one of the oldest tools of man, it is often unjustifiably assumed that further improvements in its use are unlikely or that such improvements can be obtained only with uneconomical expenditures. The evidence now on hand indicates that improvements in the application of the combustion process to specific problems are frequently possible at moderate cost.

Flames may be roughly classified as either diffusion or premixed. In the diffusion flame, the oldest form known, the fuel and oxidant burn as they mix. The candle flame, the flame of the residential oil furnace, the long radiant flame of the steel open hearth, and the tremendously intense flame of the rocket combustion chamber are all examples of diffusion flames.

In the premixed flame, the fuel and oxidant are mixed completely prior to burning. There are some examples of outstandingly successful commercial burners that use premixed gas and air. However, because of the power requirements for delivering the premixed air and gas under pressure, and the necessity of insuring against flash-back, most industrial burners are of the diffusion type, or employ a combination of the premixed and diffusion flame. For example, in a gas furnace, the fuel is mixed with the primary air and burns in a fuel-rich flame. Secondary air then diffuses with and mixes with the products of the primary flame, and the remainder of the fuel burns in a diffusion flame.



The photo on the right shows a turbulent diffusion gas flame as it is normally seen. The high-speed photo of the same flame (on the left) reveals its true fluctuating and torn nature.

The flame of most interest to industry is the diffusion flame; and, interestingly enough, the flame of the common candle displays many of the phenomena of the diffusion flame that are of importance to industry. Observation shows that the underside of the candle flame, near the melting wax, is a clear blue which is characteristic of a diffusion flame with plenty of oxygen and little of the products of combustion. This blue region is also the hottest point of the flame. The yellow mantle of flame at the top surrounds a reddish center, in which center the heat is intense enough to crack or partially to break down the fuel, which cannot burn because of insufficient oxygen. The product of the cracking process that has escaped the hot core,

where it might have been burned if enough oxygen had been present, is what is commonly known as soot.

The Soot Problem

Soot in a diffusion flame may be useful or harmful, depending on the use to which the flames are being put. Thus, in the open-hearth steel furnace, where a high rate of heat transfer to the bath is required, operation with a long, uniformly radiant flame results in a most effective heat-transfer mechanism. The fine soot particles, which are usually far less than one micron in size, reach the gas temperature quickly and radiate to the melt the heat they receive by conduction from the hot surrounding gases. An intensive study of radiant heat transfer in full-scale furnaces is being carried out at Ijmuiden, Holland, under the combined sponsorship of the industries of several nations including the United States. This research is producing results of great importance in the development of new industrial furnaces making use of radiant heating.

In many instances, however, the presence of soot has only a detrimental effect. Thus, in jet engines, soot deposits have to be guarded against carefully. Air must be passed over cold surfaces to protect them from the soot-bearing hot gases that would otherwise produce deposits. In the residential high-pressure oil furnace, improper adjustment may lead to a buildup of deposits even on the oil nozzle, thus spoiling the spray distribution. Deposits in the remainder of the furnace can also lead to lowered performance.

It is well known that one of the most severe problems in incinerators is obtaining satisfactory operation without smoke. Here again, sufficient heat must be available to volatilize the material, but sufficient oxygen must also be available to burn the volatilized products before they crack. When they do crack, and they usually do, air must be mixed in rapidly enough to burn the cracked products in a reasonable distance but without quenching the flame. Of course, the variability of the raw material and its packing, especially in residential incinerators, makes the problem extremely difficult. However, in spite of these difficulties, the fundamental principles of combustion physics are being applied with considerable success to the development of new incinerator designs by various laboratories.

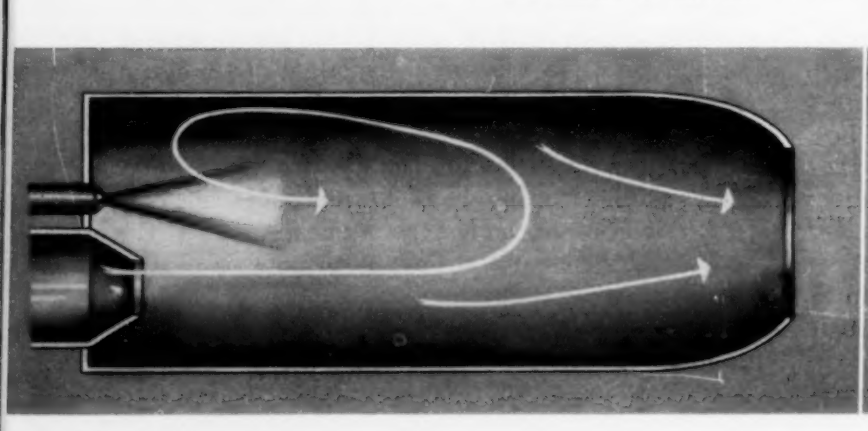
Since his association with Battelle in 1946, Abbott Putnam has worked intensively in the combustion field. He has participated in and directed fundamental and applied studies on oscillations and pulsations in combustion systems, applications of dimensional analysis to combustion problems, and on problems relating to flame holding, flame spreading, turbulence, and the effects of electric fields on flames. He is author or coauthor of more than a dozen papers and articles relating to those studies. Putnam's activities prior to joining the Institute included a period as instructor at Cornell University, where he had earlier received a B. Mech.E. degree, and service as research engineer for NACA at Langley Field.

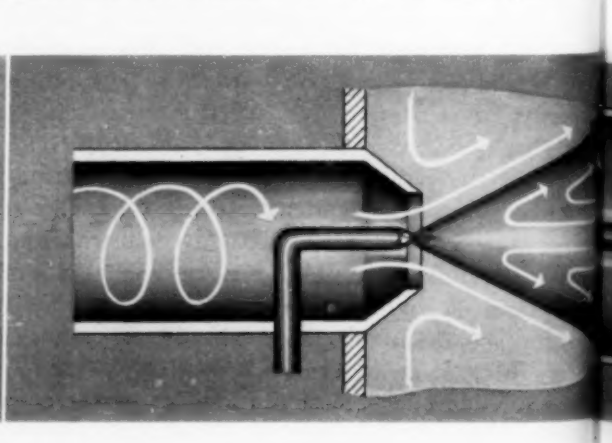
An Acceptable Flame

To obtain an acceptable diffusion flame, a number of conditions must be fulfilled:

(1) Fuel, oxygen, and heat must be brought together in such proportions as to obtain the desired rate of reaction.

(2) When liquid fuel is used, the proper amount of hot gases must be available to vaporize the liquid for





Recirculation patterns in combustion chambers may be controlled by a variety of methods. Those suggested here include (from left to right): injecting fuel and/or air to only a limited region; adding "spin" to the air to produce an additional recirculation region on the axis; controlling the amount and placement of recirculating gases by proper baffling; and with a uniform crossection, restricting the amount of inlet air.

combustion. At the same time, there must be sufficient oxygen available to burn the vaporous fuel before it gets too hot.

(3) When luminous soot particles are produced by cracking, air for their combustion must be introduced at a rate rapid enough to hold the end flame to a reasonable length, but not at such a rate as to quench or to chill it.

(4) The soot must be prevented from depositing on the cold walls of the combustion chamber before it can be burned.

Two separate conditions are required for producing a satisfactory stable diffusion flame which gives the desired reaction rate. First, the flame must be held in some region. For a low-velocity system, in which a gaseous fuel is burned in nonturbulent air, the first region where the fuel and air meet is the holding region. Since the fuel and air interdiffuse there, the requirements for a premixed flame are met. Thus the leading edge or holding line of the diffusion flame in a low-velocity stream is a premixed flame propagating against the oncoming stream of fuel and air. At high velocities, the flow of air or fuel or both may become turbulent. Yet there must still be local regions, although they may be fluctuating in position, where the flame can maintain itself against the oncoming stream. As velocities increase further, the situation becomes more confused. It is clear, however, that while a turbulent diffusion flame may look quite solid and stable, an instantaneous photograph of the flame might indicate quite another situation—with great gaps in the upstream front and large volumes of unignited mixtures downstream.

When the fuel is liquid rather than gaseous, it must be vaporized before it will burn. This vaporization is achieved partially by radiation, but to a greater extent by recirculating hot products of combustion back to the flame-holding region.

After the flame is held or stabilized, it should spread until the rest of the available fuel or oxygen, whichever is in shorter supply, is consumed. Hot products of combustion are provided from the holding region and the spreading flame to vaporize more liquid fuel and to promote ignition of the gases. Once this has been achieved, hot recirculated products of combustion are no longer needed and it is often desirable to remove the excess, if possible. However, air must still be provided to supply the oxygen.

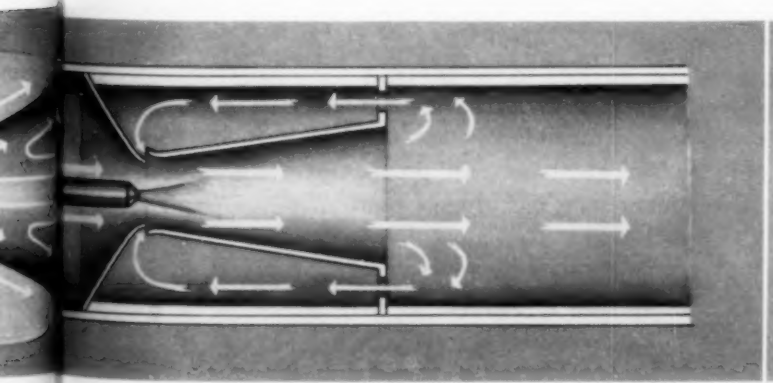
The Process of Recirculation

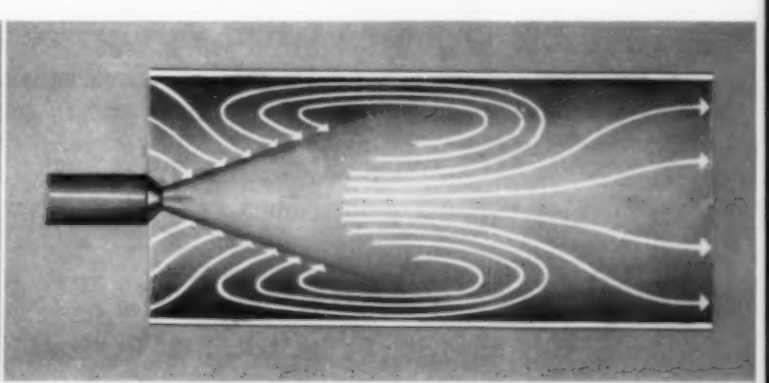
As is obvious from the previous discussion, recirculation is an exceedingly important factor in satisfactory combustion, and recirculation patterns determine the effectiveness of this process. It is these patterns, for example, which serve to bring the hot products of combustion back into the fresh air stream.

Recirculation patterns or flows are created by a momentum interchange between fast- and slow-moving streams. A common method of producing a desired pattern is to inject a fast-moving stream of air or fuel into a large combustion chamber. Other methods introduce fuel and air streams side by side, or at an angle to each other to produce more turbulence and more rapid mixing. Another possibility is to premix fuel and primary air, as in the residential single port gas furnace, and allow secondary air to enter into the combustion chamber at a slower velocity.

When liquid fuels are used, the fuel is often injected in a conical pattern, and a "spin" is imparted to the surrounding air as it is introduced. This combination results in a low-pressure region on the axis of the system and a reverse flow. Thus a second recirculation region is set up along the axis of the combustion system.

In some instances, the recirculation flow has been channeled to give better control of the recirculation pattern. This makes it easier to direct the gases to the proper place, and in the proper amount. Thus the recirculation flow can be adjusted to match changes in the type of fuel and the amount of air necessary to give the desired temperature and composition of the





products of combustion. In fact, with such a design, air-deficient flames, free of soot, can be obtained for use as reducing atmospheres in special-purpose applications. Such a development clearly illustrates how research can improve the combustion process. Yet even this highly effective system leaves much to be desired. It lacks the simplicity which the ideal combustion system should have. As we gain greater understanding of the interaction of flow and flame, combustion-system designs will become less complicated.

An expanded section is not necessary in a combustor to produce a recirculation pattern. As a jet of gas or droplets moves out from its source, it entrains surrounding air; the total amount entrained is proportional to the distance from the source. In a confined system, for example a jet in a pipe, the air available for entrainment may be limited. If the limited supply is used before the jet expands to the wall, then a recirculation flow will be set up close to the wall to make up this deficiency. Uniformity of diameter in a combustion system does not preclude the presence of recirculation resulting in the mixing of hot products with combustible mixtures.

M. W. Thring and M. P. Newby have combined theory and experimental results in an admirable way to indicate some of the basic relations of enclosed diffusion flames resulting from high-momentum fuel jets. Their studies illustrate how the ratio of chamber size to jet size affects the height of the flame, through the action of the recirculation forces. Of especial value is their correlation of cold flow tests on a 1/10 scale model of a furnace with results from a full-scale furnace. Since it is now impossible to predict results from theory alone, the possibility of successful scaling promises to be of great help in combustion research.

A point has now been reached where a sound knowledge of the fundamentals of combustion physics is required to make further significant advances. The instances cited here of the industrial incinerator and the new industrial burner design are examples of the rewards that may result from applying the fundamentals of combustion physics to practical industrial problems. Such successes, along with the possibility of using models of standard equipment for study, hold a promise of less costly research in the future.

Evaluating Processes for Research

One might expect that it would be profitable to examine each application in which the combustion process is used from the viewpoint of the fundamental process involved. The following questions suggest how a particular combustion problem may be evaluated as to its amenability to improvement by consideration of the fundamental processes involved:

(1) Can changes in burner design, based on a better understanding of combustion physics, permit increases in rating of a unit, or decreases in noise and soot?

(2) Can the better understanding of the combustion process and flow conditions in a furnace lead to a simplification of the baffle design?

(3) Can we obtain an advantage in economy, cleanliness, and quietness from a better control of the pattern of air inflow into the combustor?

(4) Is a radiant flame actually desirable or even necessary in this application?

(5) Will a radiant flame produce more desirable results than a nonradiant flame?

(6) Can the products of combustion be used directly as a source of controlled atmosphere as well as a heat source?

In many instances, the asking of such questions as these will indicate that a given combustion process can be improved, and that the application of the research approach to the combustion problem is economically justified.

A VERY HUMAN ENTERPRISE

"Science is a very human enterprise, colored by general ideas, changeable as any human activity must be, various in its possible forms, and a common part of the lives of all men. Indeed, even the impressive methods which sometimes seem so formidable—are in no sense superhuman. They involve only improvements . . . of procedures of observation and analysis which the human race has always used . . ."

Warren Weaver, President,
American Association for the Advancement of Science

NOTES from BATTELLE

* REACTOR DEVELOPMENT UNIT

A reactor development laboratory—for use by industry and government in the development of reactors for power production and propulsion—has been completed at Battelle. The laboratory, the second major unit in Battelle's new Atomic Energy Center, is the first private installation of its kind available for direct research on atomic power plants.

The new unit, a critical assembly laboratory, is currently being readied for study of problems in connection with the design and construction of reactors for electrical power plants. It will be used also for research on atomic engines for aircraft, ships, and other means of air, land, and water transport.

According to Dr. H. R. Nelson, in charge of the Battelle Atomic Research Center, all designs of nuclear reactors must be evaluated in full-scale model form to provide engineers with the information they need to build the operating reactors. In designing nuclear reactors, many decisions can be made on the basis of theory and mathematical computations. There are, however, numerous design factors that can only be determined by experimentation.

In addition to the materials themselves, the geometry, or arrangement in space, of the components of a reactor core is one of the most important determinants of reactor behavior. The new laboratory will give research technologists a tool for making the studies of reactor geometry (or arrangements of the components) that are needed before final specifications can be established for any individual reactor. It will also be used to work out practical start-up schedules, or in the case of an operating reactor, to evaluate innovations without interrupting the power plant.

The control apparatus for the critical assemblies was designed and built by Battelle engineers. The panel provides all the controls that would be found in a power reactor station and in addition, it is equipped with a number of research circuits. Closed-circuit television has been installed, allowing researchers to view the reactor cores while experiments are being performed.

Operation of reactor cores at so-called "zero power", or about 1 to 2 watts, will yield data on fuel requirements, neutron flux, power distribution, and control requirements. At the low power of 1 to 2 watts, no shielding is required, nor is it necessary to put the reactor core in a pressure vessel or to pump coolant through the core. Thus, the arrangement of fuel, moderator, control rods, and other variables is flexible and can be changed readily for experimental determination of their optimum arrangement. Nevertheless, the experimental cores mocked-up in the reactor development laboratory will contain all the types of atoms and a full complement of the materials needed for reactor cores capable of being operated at power levels on the order of 200,000 kilowatts.

The first unit in Battelle's atomic research center, a hot-cell laboratory, was completed and put in operation in September, 1955. The third unit, a swimming-pool-type research reactor, is in an advanced stage of construction and will be in operation later this year.

Dr. H. W. Russell, technical director and the Institute's senior physicist, has over-all responsibility for the technical aspects of the Institute's nuclear energy research. Nelson, manager of Battelle's department of physics, has supervision of the new research center. Dr. Sherwood L. Fawcett, chief of Battelle's engineering mechanics division, and Joel W. Chastain, Jr., assistant chief, will have supervision of the reactor development laboratory.

* FUEL ADDITIVE STUDY

Will hydrocarbon combustion be accelerated by the presence of a good source of hydrogen atoms in the flame? In an effort to throw light on this problem, Philip F. Kurz and colleagues at Battelle studied the effects of diborane—a good source of hydrogen atoms—when added to propane-air mixtures, by measuring flame speeds of the resulting mixtures.

During the investigation, different amounts of diborane were added to fuel mixtures varying from lean (i.e. having more oxygen than needed to burn the fuel) to moderately rich (i.e. lacking adequate oxygen for complete fuel combustion). The effects of diborane additions were evaluated by comparing flame speeds of the various mixtures.

Kurz reports that additions of diborane in amounts of 5 per cent or less tended to slow flame speeds below the speeds for propane-air mixtures alone. Additions

of diborane up to 20 per cent in lean mixtures produced no increase in flame speed.

In slightly rich mixtures, however, a 10 per cent diborane addition increased flame speed somewhat under 10 per cent, and a 32 per cent diborane addition gave a 32 per cent increase in flame speed. But in moderately rich mixtures, a 33-1/3 per cent diborane addition achieved an increase of about 65 per cent in flame speed.

The conclusion from the study is that when diborane is present in propane in amounts of 5 per cent or less, the two fuels appear to mutually inhibit their combustion processes. Under these conditions, any increase in hydrogen-atom concentration caused by the presence of the diborane is counteracted. In moderately rich mixtures the diborane appears to burn selectively, thereby pre-empting its full oxygen requirements and increasing the apparent flame speed of the mixture. The propane, however, burns more slowly because of a substantial deficiency of oxygen. This process masks any effect of the increased hydrogen concentration resulting from the presence of diborane in the flame.

* DROP-SIZE DISTRIBUTIONS

The experimental determination of drop-size distributions of fuel sprays is important for all studies involving the atomization of liquid fuels. Such determinations are important for investigations relating to the mechanism of atomization, studies of the factors that determine fineness of the spray, research on methods of atomization, and studies of nozzle design. Yet studies of drop-size distributions are difficult because a simple, feasible, and accurate method of describing the spray in terms of drop size is lacking.

In a paper to be presented at the American Chemical Society's Symposium on the Literature of the Combustion of Petroleum, J. Mason Pilcher of Battelle, and Ralph E. Thomas review possible methods for such determinations.

The paper discusses and evaluates the six general types of procedures now being employed for determining drop size. These types are: (1) microscopic examination of drops collected on slides or in cells; (2) freezing of drops in spray, followed by sieving; (3) direct photographic methods; (4) optical methods based on the scattering or absorption of light; (5) electronic and radioautographic techniques; and (6) selective impaction.

The last type, through the employment of the cascade impactor, appears to be most promising for determining drop-size distributions of fine sprays containing drops under 100 microns in diameter.

In the second part of the paper, Thomas summarizes the principal mathematical relations involving the basic types of drop-size distributions and their averages. He points out that at present, only general outlines of the mathematical criteria appropriate to all techniques are apparent.

* XERORADIOGRAPHY

Xeroradiography, which makes possible the viewing of a fully developed X-ray picture in 40 seconds, was recently announced by the General Electric Company, X-ray Department, Milwaukee, Wisconsin. The new process produces an image by dry, electrostatic methods on a selenium-coated aluminum plate. The image can be erased and the plate reused many times.

The new apparatus has been successfully field tested for both civil defense and industrial uses. However, it is still being perfected for commercial sale.

The xeroradiographic process provides greater speed than current quick-film-processing methods; its plates are not damaged by atomic or other radiations; it eliminates the need for film storage and darkroom facilities; and it provides a sharply defined image covering a wide range of tissue in one exposure.

Xeroradiography has been under development and field testing for several years. It is the result of work by the Haloid Company and Battelle in cooperation with General Electric Company. The process is based upon two patents in the names of Roland M. Schaffert, Robert C. McMaster, and William E. Bixby and Michael D. Phillips, all of Battelle.

An improved method for distinguishing hog bristle from horsehair has been developed at Battelle. George G. Cocks, Carl W. Melton, and C. M. Schwartz of the Institute's structural chemistry division report that the identification can be made by applying the shadowed-replica technique to the light microscope. The technique can be used to study scale frequency as observable in hair and bristle impressions in a plastic surface.

Patents recently issued to Battelle staff members:

Patent 2,729,601, "Electroplating in Beryllium", to John G. Beach and Charles L. Faust; and Patent 2,730,850, "Sharpening Attachment for a Cloth Cutting Machine", to Robert M. Conklin and Albert M. Rockwood.

Writings by STAFF Members

The Metallurgy of Zirconium. National Nuclear Energy Series, Division VII, v. IV. 1955. Contains the following papers by Battelle staff members.

Joining and Finishing of Zirconium. VIII. Plating. J. G. Beach. pp. 337-347.

Describes preparation of electroplated and hot-dip coatings on zirconium and the electrodeposition of zirconium on iron, nickel, molybdenum, titanium, or zirconium alloys.

Mechanical Properties of Zirconium and Its Alloys. W. Chubb, G. T. Muehlenkamp, F. R. Shober, and A. D. Schwope. pp. 490-552.

The mechanical property data available up to 1954 with respect to zirconium and its alloys have been collected and evaluated. Presents and discusses tabulations of pertinent tensile, impact, creep, fatigue, and hardness data.

Application of Zirconium for Other Uses. R. I. Jaffee. pp. 19-49.

Describes advantages and uses of zirconium alloys and compounds in chemical and electrical equipment, as an alloying addition, and in miscellaneous applications.

Joining and Finishing of Zirconium. IV. Brazing. J. R. Keeler. pp. 325-326.

Zirconium is difficult to braze because of its refractory oxide film and because it forms brittle intermetallic compounds with all of the common brazing metals. By using a flux similar to that used for titanium, silver solder joints can be made, but the joints are brittle and have poor corrosion resistance in high temperature water.

Joining and Finishing of Zirconium. III. Solid-Phase Welding. S. J. Paprocki. pp. 322-325.

Describes bonding and cladding methods including roll cladding, swaging and drawing, and powder-metallurgical techniques.

An Evaluation of Organic Coatings for Use in Cathodically Protected Domestic Hot Water Tanks. B. G. Brand, F. W. Fink, G. A. Hudson, and E. R. Mueller. *Paint and Varnish Production*, January, 1956, pp. 25-32.

Reports that epoxy-phenolic resins appear to solve the need for alkali resistance and water impermeability in organic coatings used in domestic hot water tanks protected with magnesium anodes.

A Method for Estimating Allowable Load Capacities of Columns Subject to Creep. R. L. Carlson and A. D. Schwope. Paper from *Proceedings of the Second U. S. National Congress of Applied Mechanics*, 1954, pp. 563-568.

Presents a method for estimating allowable load capacities of columns subject to creep. The method utilizes approximate stress distributions derived from standard creep data, and it provides conservative estimates of column capacity.

Electropolishing. Charles L. Faust. *Metal Finishing (Guidebook—Directory Ed.)*, 1956, pp. 415-424.

Discusses advantages and limitations of electropolishing, as well as costs, general procedures, commercial methods, and equipment.

Corrosion Studies Aid Light Metals. Frederick W. Fink. *Corrosion Technology*, December, 1955, pp. 372-374.

Discusses the factors that have made aluminum, magnesium, and titanium of greater industrial importance.

Prepare Your Own Catalog Cards. Robert W. Gibson, Jr., Ralph L. Darby, and Melvin C. Koch. *Special Libraries*, December, 1955, pp. 428-433.

Describes a streamlined procedure for preparing catalog cards which involves reproduction of cards by xerographic methods and reduction in size of type to give maximum information with good readability.

Reversal Development of Continuous-Tone Xerographic Images. R. E. Hayford and W. E. Bixby. *Photographic Engineering*, 1955, pp. 173-182.

Describes how a negative-to-positive xerographic image may be obtained by adjusting the electrical field above the plate during development.

Hydrogen Contamination in Descaling and Acid Pickling of Titanium. G. A. Lenning, C. M. Craighead, and R. I. Jaffee. *American Society for Metals, Transactions.* Preprint No. 33, 1955, 10 pp.

Reports that an increased ratio of surface area to mass and longer time in the bath will increase hydrogen absorption by titanium. In use of the Virgo bath, surface pitting was in evidence, but no hydrogen pickup occurred.

Transformation Kinetics of Uranium-Molybdenum Alloys. H. A. Saller, F. A. Rough, and A. A. Bauer. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, October, 1954, 26 pp.

Reports an investigation of the nature of the transformation product and the kinetics of the metastable-gamma decomposition.

Battelle In Europe. B. D. Thomas. *Chemical and Engineering News*, November 28, 1955, pp. 5168-5170.

Establishing of a nonprofit research foundation, a relatively new concept in Europe, proves profitable in better international relations as well as for industry.

Thermodynamic Data on Oxides at Elevated Temperatures. Harlan P. Tripp and Burnham W. King. *American Ceramic Society, Journal*, December, 1955, pp. 432-437.

Presents data on the free energy of formation of oxides in graphic form, thus making it possible to obtain the free energy of most ceramic oxides in the temperature range 0 to 2400 C.

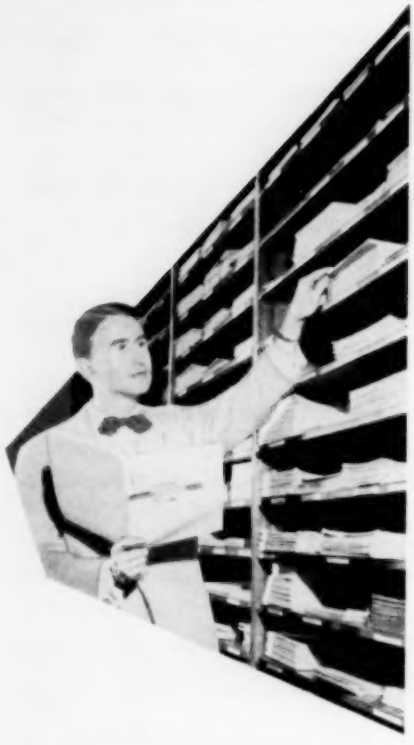
Preparation of High-Purity Thorium by the Iodide Process. N. D. Veigel, E. M. Sherwood, and I. E. Campbell. *Electrochemical Society, Journal*, December, 1955, pp. 687-689.

This paper describes the preparation of massive thorium of high purity by the van Arkel-de Boer (iodide decomposition) process. A substantial reduction is obtained in the non-metallic impurity content of metal so prepared as compared to that of the feed material.

Magnetoresistance. New Tool for Electrical Control Circuits. R. K. Willardson and A. C. Beer. *Electrical Manufacturing*, January, 1956, pp. 79-84.

Presents the operating principles of the magnetoresistive element and describes the physical characteristics of indium antimonide. Several possible applications of the latter are also suggested.

Members of the Battelle staff are authors of the recently published articles and books listed on this page. In most cases, reprints are available from the Battelle Publications Office, 505 King Avenue, Columbus 1, Ohio.



ABSTRACTS *in the* FIELDS *of*

93a Aeronautical Engineering
93a Agriculture
94a Biochemical and Biophysical Research
95a Ceramics and Concrete
96a Chemical Engineering
97a Chemistry—Analytical and Inorganic
98a Chemistry—Organic
99a Chemistry—Physical
100a Coatings
102a Corrosion
103a Electrical Engineering
104a Electrochemistry and Electroprocesses
107a Electronics
109a Engineering Economics
109a Fluid Mechanics
110a Food Technology
110a Fuels and Combustion
110a Geology and Mineralogy
111a Geophysics
111a Graphic Arts
111a Heat Power
112a Information—Preparation and Dissemination
112a Instrumentation and Laboratory Apparatus
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BATTELLE Technical Review ABSTRACTS

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AERONAUTICAL ENGINEERING

1826* Note on a Null Method for the Direct Measurement of Pressure Coefficients. L. H. Tanner. *Aeronautical Quarterly*, v. 6, Nov. 1955, p. 241-253.

Values of the pressure coefficient between +1 and −1 can be measured directly in incompressible flow by comparison with the known pressures on a circular cylinder placed in the tunnel working section. Graphs, diagrams, tables. 3 ref.

1827 Papers Presented at the Sixth Meeting of the Wind Tunnel and Model Testing Panel. (English and French.) *AGARD Memorandum* AG17/P7, 440 p. (TL565 Ag11)

Seventeen papers on the calibration of test sections, requirements for uniformity and calibration of flow, scale effects, transonic wind tunnel development, heat transfer, ultra-high temperature, and the vertical spinning tunnel. Diagrams, graphs, photographs.

1828 Progress in Research on High Speed Flow. II. Transonic Flow. Maurice Holt. *Aircraft Engineering*, v. 27, Dec. 1955, p. 392-395.

Mathematical analysis of air flow past double wedges and past an airfoil of general shape. Diagrams. 15 ref.

1829 Problems Associated With the Design and Construction of Wind Tunnels. E. F. Burford. *British Welding Journal*, v. 2, Dec. 1955, p. 541-549.

Welding aspects of the design and construction of a high-speed and a low-speed wind tunnel. The high-speed tunnel, required for use at near to supersonic speeds, is powered by three jet engines. Special factors that had to be considered were the high operating temperatures, and the possibility of pronounced vibration, drumming, and noise. The low-speed tunnel is of orthodox design, and is fan-driven. Diagrams, photographs.

1830* Review of the Principal French Airplanes Presented at the 21st Aeronautical Exposition, With Additional Details on the European Fiat and Fokker. **Revue des principaux avions Français présentés au XXIe Salon de l'Aéronautique avec compléments sur les européens Fiat et Fokker.** (French.) G. Bruner. *DOCAERO; revue documentaire de la technique aéronautique mondiale*, 1955, no. 35, Oct., p. 3-30.

General characteristics, construction details, and known performances of 14 French airplanes. Photographs, diagrams, table.

1831 Optimal Trajectories in the Horizontal Plane. Hermann Behrbohm. *SAAB Aircraft Company, Technical Notes, SAAB TN* 33, 1955, 24 p. (TL504 Sv23t)

A mathematical analysis. 6 ref.

1832 Optimal Trajectories in the Vertical Plane. Hermann Behrbohm. *SAAB Aircraft Company, Technical Notes, SAAB TN* 34, 1955, 22 p. (TL504 Sv23t)

Studies of the problems of the time- and fuel-optimal flight paths with prescribed endpoints. 4 ref.

1833* Aerodynamics and Performance of the Helicopter. **Aerodynamika i osiągi śmigłowca.** (Polish.) Jan Koźniewski. *Technika lotnicza*, v. 10, no. 6, Nov.-Dec. 1955, p. 159-171.

Formulas for vertical flight; airfoils and resistance to flight; components of total power required for horizontal flight. Graphs, diagrams. 9 ref.

See also: **2121** (fuel cut-off control for missiles); **2207** (ballistic missile powerplants).

AGRICULTURE

1834 Some Effects of an Anionic Sodium Sulfonate Type Surfactant Upon Plant Growth. E. C. Spurrier and J. A. Jackobs. *Agronomy Journal*, v. 47, Oct. 1955, p. 462-465.

Response to N not increased, however, there was less burning from a high N content fertilizer. Affects water movement and evaporation. Low concentrations have no beneficial or detrimental effects on plant growth. Tables.

1835* The Parasitic Growth of *Claviceps purpurea* (Fries) Tulasne on Rye and Its Relation to Alkaloid Formation. Egil Ramstad and Gunnar Gjerstad. *American Pharmaceutical Association, Journal (Scientific Ed.)*, v. 44, Dec. 1955, p. 741-743.

Report of study of various stages in development of ergot and ability to produce alkaloids. Micrographs, photograph. 8 ref.

1836* Potassium Deficiency of Alfalfa in California. W. E. Martin, Albert Ulrich, Morton Morse, and D. L. Mikkelson. *Better Crops With Plant Food*, v. 39, Dec. 1955, p. 6-12, 46-51.

Nutrient survey based in interpretation of alfalfa stem analyses, P and K supplies, and geographic distribution of K. Map, tables, photographs, graphs.

1837* Nitrogen Influence Intake of Other Nutrients by Plants. E. O. McLean. *Better Crops With Plant Food*, v. 39, Dec. 1955, p. 17-18, 40-41.

Cation exchange capacity of plant roots; difference in uptake of Ca and K; effects of N in the roots. Table.

1838 Dextran and Dextran Products as Soil-Conditioning Materials. L. J. Novak, E. E. Witt, and Malvern J. Hiler. *Journal of Agricultural and Food Chemistry*, v. 3, Dec. 1955, p. 1028-1033.

Marked stabilization of soils, up to 60% increased plant seedling emergence, and up to 70% better crop yield, have been demonstrated with soils containing specific dextran products. Tables, graph, photographs. 14 ref.

1839 Enzyme Supplementation of Baby Pig Diets. C. J. Lewis, D. V. Catron, C. H. Liu, V. C. Speer, and G. C. Ashton. *Journal of Agricultural and Food Chemistry*, v. 3, Dec. 1955, p. 1047-1050.

Supplementation of soybean protein and casein basal diets for baby pigs with certain proteolytic enzymes increased gains and feed efficiency. Tables. 11 ref.

1840* A Comparison of Three Methods of Eliminating Cull Trees From Woodlands With 2,4,5-T. J. J. Jokela and Ralph W. Lorenz. *Journal of Forestry*, v. 53, Dec. 1955, p. 901-904.

Suggests a possible means of reducing the cost. Graphs, tables. 3 ref.

1841* Effects of Polluted Atmospheres on Organic Acid Composition in Plant Tissues. Paul P. Mader, George Cann, and Lucille Palmer. *Plant Physiology*, v. 30, no. 4, July 1955, p. 318-323.

Study of effect of Los Angeles smog on plant tissues. Graphs, tables. 9 ref.

1842* Effect of Certain Metabolic Inhibitors on Translocation of P^{32} in Bean Plants. W. A. Kendall. *Plant Physiology*, v. 30, no. 4, July 1955, p. 347-350.

Effort made to isolate the phases of metabolism most closely associated with the transport mechanism. Various chemicals which might be expected to influence the metabolism of plant cells were injected into the treated leaf petioles. Tables. 11 ref.

1843* Incorporation of Radioactive Amino Acids Into the Proteins of Plant Tissue Homogenates. George C. Webster. *Plant Physiology*, v. 30, no. 4, July 1955, p. 351-355.

Detailed investigation of the incorporation of amino acids into the proteins of cell-free extracts of higher plants. Reports results on the nature of the incorporation process and on the partial purification and properties of a particulate system from pea seedlings that incorporates amino acids at relatively high rates. Tables. 16 ref.

1844* Transpiration and the Absorption and Distribution of Radioactive Phosphorus in Plants. Kenneth E. Wright and Nancy L. Barton. *Plant Physiology*, v. 30, no. 4, July 1955, p. 386-388.

Effects of transpiration upon the absorption and translocation of radioactive phosphorus in the sunflower plant, using the autoradiogram technique. 12 ref.

1845 The Influence of Soil Organic Matter on the Uptake of Sr90 by Barley and Tomato Plants. Hideo Nishita, Bruce W. Kowalewsky, and Kermit H. Larson. *University of California, Los Angeles Campus, School of Medicine (U. S. Atomic Energy Commission)*, UCLA-349, Oct. 1955, 42 p. (UF767 Un3.1uc)

The uptake of Sr90 decreases as the concentration of organic matter in the soil is increased. Soil type, plant incubation time before cropping, and the kind of organic material used are also influencing factors. Tables, graphs. 29 ref.

1846 Plant Uptake of Fe59-Tagged Iron From a Slowly Soluble Source. W. A. Rhoads, E. M. Romney, and A. Wallace. *University of California, Los Angeles Campus, School of Medicine (U. S. Atomic Energy Commission)*, UCLA-350, Oct. 1955, 19 p. (UF767 Un3.1uc)

Less than 0.025% of the total amount of the tagged iron, applied to different soils, appeared in crops of barley, soybean, and lemon plants. Tables. 13 ref.

1847 The Effect of Certain Environmental Factors on Calcium, Phosphorus, and Strontium Uptake by Barley. W. L. Ehrler, E. M. Romney, and K. C. Hamner. *University of California, Los Angeles Campus, School of Medicine (U. S. Atomic Energy Commission)*, UCLA-351, Oct. 1955, 22 p. (UF767 Un3.1uc)

Tracer isotopes of the elements were used to study the effects of short term variations in cation balance, root temperature, and duration of light period on Ca, P, and Sr uptake. Tables, diagrams. 10 ref.

1848 Agricultural Research Program. *University of Tennessee (U. S. Atomic Energy Commission)*, ORO-145, Nov. 1955, 128 p. (UF767 Un3.1or)

Absorption, tissue distribution and excretion as related to the chemical form of fission products. Effect of hormones, vitamins, minerals, and proteins on tissue distribution and excretion of fission products. Specie and age differences were observed in view of the metabolism of fission products. Tables, graphs. 20 ref.

1849* Conservation Potential of Sewage Sludge. James F. Thomson and James M. Morgan, Jr. *Water & Sewage Works*, v. 102, Dec. 1955, p. 532-535.

Effects of sewage sludge used in fertilizing are discussed. Tables. 6 ref.

See also: **1922** (soil analysis).

BIOCHEMICAL AND BIOPHYSICAL RESEARCH

1850 Effects of Electromagnetic Energy on Plants and Animals. Vernon H. Baker, Dennis E. Wiant, and Oscar Taboada. *Agricultural Engineering*, v. 36, Dec. 1955, p. 808-812.

Includes diagrams, micrographs. 12 ref.

1851 Puromycin. Synthetic Studies XIII. Synthesis of 6-Dimethylamino-9-(3′-amino-3′-deoxy-β-D-arabinofuranosyl)-Purine. XIV. Use of the N-Phthalyl Blocking Group for Synthesis of Aminonucleosides. XV. 3′-Amino-3′-Deoxyadenosine. B. R. Baker, Robert E. Schaub, J. P. Joseph, and Henry M. Kissman. *American Chemical Society, Journal*, v. 77, Nov. 20, 1955, p. 5900-5915.

50 ref.

1852 Equilibria in the Fibrinogen-Fibrin Conversion. III. Heats of Polymerization and Clotting of Fibrin Monomer. Julian M. Sturtevant, Michael Laskowski, Jr., Thomas H. Donnelly, and Harold A. Scheraga. *American Chemical Society, Journal*, v. 77, Dec. 5, 1955, p. 6168-6172.

Includes diagram, graphs. 29 ref.

1853* Maintenance of Cultures of Industrially Important Microorganisms. W. C. Haynes, L. J. Wickerham, and C. W. Hesseltine. *Applied Microbiology*, v. 3, Nov. 1955, p. 361-368.

Includes table, photographs. 1 ref.

1854 Fermentation—A Chemical Engineering Approach. Elmer L. Gaden, Jr. *Chemical Engineering Progress*, v. 51, Dec. 1955, p. 540-543.

An interpretation of microbiological processes for chemical production with respect to changes in process variables. Chart, diagram, graph. 6 ref.

1855 Studies of *Aspergillus niger*. IV. The Synthesis of β-Linked Glucosaccharides. S. A. Barker, E. J. Bourne, G. C. Hewitt, and M. Stacey. *Chemical Society, Journal*, 1955, Nov., p. 3734-3740.

A study has been made of the oligosaccharides formed from cellobiose by growing cultures of *Asperillus niger* (strain 152), resting cells, and cell-free extracts. Tables.

1856* Antigenicity of Synthetic Polypeptides. **L'antigénicité des polypeptides synthétiques.** (French.) Mark A. Stahman, Henry Tsuyuki, Karl Weinke, Claude Lapresle, and Pierre Grabar. *Comptes rendus*, v. 241, no. 21, Nov. 21, 1955, p. 1528-1529.

Study of the antigenic activity of polypeptides prepared with leucine, phenylalanine, glutamic acid, and lysine, injected into the rabbit. 10 ref.

1857 Protein Synthesis in Isolated Cell Nuclei. V. G. Allfrey, A. E. Mirsky, and Syozo Osawa. *Nature*, v. 176, Dec. 3, 1955, p. 1042-1049.

The role of deoxyribonucleic acid and the capacity of the thymocyte nucleus to meet its energy requirements through the synthesis of high-energy phosphate bonds. Tables, graphs. 15 ref.

1858 Iodine Sanitizing Solutions. Louis Gershenfeld and Bernard Witlin. *Soap and Chemical Specialties*, v. 31, Dec. 1955, p. 189 + 6 pages.

Study of the bactericidal efficiency of commercially available iodophors and other preparations of free iodine recommended for use in sanitization procedures.

1859 Notions on Sensitivity of Cells to Radiation. Ole A. Schjeide, James F. Mead, and Lawrence S. Myers, Jr. *University of California, Los Angeles Campus, School of Medicine (U. S. Atomic Energy Commission)*, UCLA-348, Oct. 1955, 19 p. (UF767 Un3.1uc)

Initial damage by irradiation occurs in the cell nucleus. Cells having large nucleii are particularly sensitive to radiation. 42 ref.

1860* Acting Spectrum of Photosynthetic Ferment. **Wirkungsspektrum eines Photosynthese-Frements.** (German.) Otto Warburg, Günter Krippahl, and Walter Schröder. *Zeitscrift fur Naturforschung*, v. 10b, no. 11, Nov. 1955, p. 631-639.

By addition of different wave lengths to a red measuring light, an acting spectrum of photosyntheticferment has been obtained. Tables, diagram, ultra-violet spectrograms. 8 ref.

Books and Miscellaneous Publications

1861 Radiobiology Symposium 1954. (English and French.) Z. M. Bacq and Peter Alexander, editors. 362 p. 1955, Academic Press, New York. (QH652 R11p)

A compilation of 50 papers on the various aspects and applications of the science.

1862 Autoradiography in Biology and Medicine. George A. Boyd. 399 p. 1955. Academic Press, New York. (TR751 B69a)

Theory to provide background for a scientific approach to the art with techniques explained in "cookbook" style. An extensive bibliography for the period up to 1953.

1863 The Alkaloids. R. H. F. Manske, editor. v. V. 388 p. 1955. Academic Press, New York. (QD421 M31a)

Eleven papers covering the pharmacological actions of narcotics, analgesics, respiratory and uterine stimulants, curare-like effects, the cardioactive, pressor, and mydriatic alkaloids, and alkaloids as local anesthetics; the chemistry of the Lycopodium alkaloids and lessor known substances with unknown structure.

See also: **1848** (fission product metabolism).

CERAMICS AND CONCRETE

1864 The Aging Effect in Barium Titanate. M. C. McQuarrie and W. R. Buessem. *American Ceramic Society Bulletin*, v. 34, Dec. 1955, p. 402-406.

It is suggested that the aging rate is greater, the nearer the c/a ratio is to one. Difficulties involved in measuring the aging effect are pointed out, and an experimental technique is described. Graphs, diagrams, photograph, tables. 17 ref.

1865 Comparison of Modulus of Rupture Values Obtained Using Center- and Third-Point Loading. A. J. Metzger and F. W. Thompson. *American Ceramic Society Bulletin*, v. 34, Dec. 1955, p. 415-417.

No significant difference in the variability was found. A method of variance analysis for assessing the significance of difference in variability between the two methods of loading is given. Diagrams, tables. 7 ref.

1866 Formation of Color Centers in Glasses Exposed to Gamma Radiation. N. J. Kreidl and J. R. Hensler. *American Ceramic Society, Journal*, v. 38, Dec. 1955, p. 423-432.

Glasses exposed to γ radiation develop a visible absorption band similar to the *F*-band developed in alkali halide crystals. Attempts to clarify mechanism of coloration and its prevention by Ce. Graphs. 26 ref.

1867 Thermodynamic Data on Oxides at Elevated Temperatures. Harlan P. Tripp and Burnham W. King. *American Ceramic Society, Journal*, v. 38, Dec. 1955, p. 432-437.

An extensive compilation of data on the free energy of formation of oxides is presented in graphic form. From these curves it is possible to obtain the free energy of most ceramic oxides in the temperature range 0 to 2400 C. Graphs. 10 ref.

1868 Fundamental Study and Equipment for Sintering and Testing of Cermet Bodies. VII. Fabrication, Testing, and Properties of 34 Al_2O_3—66 Cr-Mo Cermets. Thomas S. Shevlin and Charles A. Hauck. *American Ceramic Society, Journal*, v. 38, Dec. 1955, p. 450-454.

Usefulness in high-stress service to 1800 F is indicated by stress-rupture behavior, oxidation resistance, and thermal-shock resistance. Photograph, graphs, micrograph. 2 ref.

1869 Clay Particle Dispersion in Organic Media. Charles L. Folkers and A. Philip Welch. *American Ceramic Society, Journal*, v. 38, Dec. 1955, p. 454-461.

Kaolin dispersion studies to evaluate the effectiveness of each medium in maintaining a dispersed clay suspension with minimum clay-liquid complex effects. Tables, graphs. 34 ref.

1870 Physical and X-Ray Study of the Disilicides of Titanium, Zirconium, and Hafnium. Perry G. Cotter, J. A. Kohn, and R. A. Potter. *American Ceramic Society, Journal*, v. 39, Jan. 1956, p. 11-12.

Examination of the properties shows the compounds to be too brittle and have no value as industrial hard materials. Table. 10 ref.

1871 Development of Safe Cooling Schedules for Structural Clay Products. Irwin M. Lachman and J. O. Everhart. *American Ceramic Society, Journal*, v. 39, Jan. 1956, p. 30-38.

Schedules are based on a criterion for thermal failure. The coefficient of linear thermal contraction has the greatest effect on the cooling schedule. Table, diagrams, graphs. 15 ref.

1872* **Some Volume Changes in Mortars and Concrete.** F. O. Anderegg and J. A. Anderegg. *ASTM Bulletin*, 1955, no. 210, Dec., p. 60-64; disc., p. 64-65.

Reports investigation on autoclave expansion and masonry movements, sand grading and shrinkage, and mortar movements in concrete made from blended cements. Graphs, tables, photographs. 11 ref.

1873* Tests on the Resistance of Refractory Products to Corrosion by Steel & Slag. **Étude de la corrosion des produits réfractaires par les aciers et les laitiers.** (French.) J. Massieye and L. Lecrivain. *Bulletin de la société française de ceramique*, 1955, no. 28, July-Sept., p. 13-19; disc., p. 20-22.

An apparatus developed to reproduce, on a laboratory scale, the actual conditions for corrosion and erosion of refractories. Diagram, photographs. 9 ref.

1874 Recent Developments in the Technology of Ceramic Materials for Nuclear Energy Service. J. M. Warde and J. R. Johnson. *Franklin Institute, Journal*, v. 260, Dec. 1955, p. 455-466.

Materials tested are of interest in reactors intended for high-temperature operations. They also have potential application because of their nuclear properties and corrosion resistance. Graphs, photographs, tables. 14 ref.

1875 Hot Pressed Boron Nitride. K. M. Taylor. *Industrial and Engineering Chemistry*, v. 47, Dec. 1955, p. 2506-2509.

The body tested resembles graphite in crystalline structure, machining, and lubricating properties, but differs in temperature strength and electrical resistivity. Other properties are noted. Photograph, graphs, tables. 4 ref.

1876 Special Refractories for Use Above 1700° C. O. J. Whittemore, Jr. *Industrial and Engineering Chemistry*, v. 47, Dec. 1955, p. 2510-2512.

The properties, applications, and limitations of pure oxide refractories are discussed. Special refractory development is also concentrating on the refractory carbides, borides, and nitrides. Tables, photographs. 12 ref.

1877 New Uses for Superrefractories in the Chemical Industry. H. L. Read, F. C. Roe, H. S. Schroeder, and W. L. Wroten. *Industrial and Engineering Chemistry*, v. 47, Dec. 1955, p. 2513-2516.

Principal material used is SiC. Manufacturing technique has developed extensively so that intricate shapes are available to supplement ordinary brick shape. Table, diagrams, photographs.

1878* Action of Different Fluxes on Tile Glazes. **Action des différents fondants sur les pâtes à carreaux de revêtement.** (French.) *Industrie céramique*, 1955, no. 469, Nov., p. 255-261.

Discusses different raw materials, preparation, and results of tests. Recommends use of talc or fluospar. Table, graphs. 5 ref.

1879 Properties of Piezoelectric Ceramics in the Solid-Solution Series Lead Titanate-Lead Zirconate-Lead Oxide: Tin Oxide and Lead Titanate-Lead Hafnate. B. Jaffe, R. S. Roth, and S. Marzullo. *Journal of Research, National Bureau of Standards*, v. 55, Nov. 1955, p. 239-254.

Includes graphs, tables, phase diagrams, diagrams. 26 ref.

1880* Production of Carbon Refractories From Petroleum Coke. H. P. S. Murthy and Rabindar Singh. *Journal of Scientific & Industrial Research*, v. 14, sec. B, Nov. 1955, p. 597-602.

Calcination characteristics were determined and C mixes designed on the basis of the packing characteristics of coke particles. An assessment is made of influence of quality and quantity of binder on properties of resultant products. Tables. 1 ref.

1881 The Increasing Importance of Glass in the Metal Working Industries. *Machinery (London)*, v. 87, Dec. 2, 1955, p. 1279, 1328.

Brief survey of applications of glass in structures, jigs, and molds. Use of glass as a lubricant in forging and extrusion operations.

1882 Study of Metal-Ceramic Interactions at Elevated Temperatures. F. H. Norton and W. D. Kingery. *Massachusetts Institute of Technology (U. S. Atomic Energy Commission)*, NYO-4632, Oct. 1955, 7 p. (UF767 U3ny)

An increase of surface tension from 250 dynes per cm. at 1150 C to 263 dynes per cm. at 1400 C occurs in liquid GeO_2. Pure Ni has a negative temperature coefficient of surface tension. Graphs, table.

1883* Dolomite Bricks in the Steel Industry. **Le problème des briques de dolomie en sidérurgie.** (French.) Marcel Guédras. *Métallurgie et la construction mécanique*, v. 87, no. 11, Nov. 1955, p. 871-873.

Describes process of manufacturing bricks from dolomite and serpentine, by fusion and application of high pressure.

1884* Theory of Spontaneous Deformation of Barium Titanate. (English.) Wataru Kinase and Hidetoshi Takahashi. *Physical Society of Japan, Journal*, v. 10, no. 11, Nov. 1955, p. 942-952.

Obtains a quantitative theory of the spontaneous electrostruction of $BaTiO_3$ crystal in the tetragonal phase.

1885* Density Analysis of Glass in Transformation Range. (English.) Eizô Kanai and Takesi Satoh. *Physical Society of Japan, Journal*, v. 10, no. 11, Nov. 1955, p. 1002-1006.

The rate equation of the network deformation plays the essential role in the stabilization process of glass. Activation energy of the rate mechanism is dependent upon the network temperature in accordance with the theory and its numerical value is nearly equal to the activation energy of viscosity. Graphs. 10 ref.

1886* Some Observations on Refractories for Gas Retorts. H. Oliver, and K. Carr. *Refractories Journal*, v. 31, Nov. 1955, p. 588-593.

Behavior of refractory materials in retort settings; comparative data of composition of coal ash and mineral of flakes from retorts in which the coal was carbonized; retort maintenance; vertical retort life, and research and trends. Graph, tables.

1887* Comparative Study of Some Properties Relative to Slags and Ashes. **Étude comparée de quelques propriétés relatives aux laitiers et aux cendres.** (French.) Albert Nicol and Marthe Domine-Berges. *Silicates industriels*, v. 20, no. 11, Nov. 1955, p. 410-418.

Discusses action of water; electrolysis; and action of pressure and temperature on slag powder. Tables, graphs, diagrams. 3 ref.

1888* New High-Speed Cutting Material. *Western Machinery and Steel World*, v. 46, Dec. 1955, p. 78-79.

Machining speeds in the 2500 s.f.p.m. range predicted with use of cemented oxide. Micrograph, photographs.

1889* Possibility of Reducing the Heating Time of Silica Open-Hearth Roofs. **O możliwości skrócenia czasu nagrzewania krzemionkowych sklepień martenowskich.** (Polish.) Stanisław Pawłowski. *Wiadomości hutnicze*, v. 11, no. 10, Oct. 1955, p. 302-306.

Heat curves for silica roofs; relation of mineralogical composition to specific wt. of roof components; strength of roof materials before and after heating. Graphs, tables. 6 ref.

1890* Calculation of Viscosity in Range of 10^8 to 10^{10} Poises for Silica Glasses. **Raschet viazkosti silikatnykh stekol v intervale 10^8-10^{10} puazov.** (Russian.) M. V. Okhatin. *Zhurnal fizicheskoi khimii*, v. 24, no. 10, Oct. 1955, p. 1751-1754.

Using an exponential formula, expressing the relation between viscosity and temperature for glass of a given chemical composition, the temperature can be calculated if viscosity is given. Tables. 3 ref.

1891* Study of Sulfate-Resistance of Portland Cements With Varying Content of Tricalcium Aluminate. **Izuchenie sul'fatostoikosti portlandtsementov s razlichnym soderzhaniem trekhkal'tsievogo aliuminata.** (Russian.) P. P. Budnikov and O. I. Gracheva. *Zhurnal prikladnoi khimii*, v. 28, no. 11, Nov. 1955, p. 1145-1155.

Includes tables, graphs. 6 ref.

Books and Miscellaneous Publications

1892 The Technology of Cement and Concrete. v. I. Concrete Materials. Robert F. Blanks and Henry L. Kennedy. 422 p. 1955. John Wiley & Sons, New York. (TP881 B61t)

Comprehensive coverage of cementing materials and admixtures, and concrete aggregates.

CHEMICAL ENGINEERING

1893* Distillation Program. **La agenda de destilación.** (Spanish.) R. Simón Arias. *Acero y energía*, v. 12, no. 71, Sept-Oct. 1955, p. 51 + 20 pages.

Preliminary work in preparation for distillation, including liquid-vapor equilibria, distillation and rectification, and construction of columns. Diagrams, graphs, charts, tables. 40 ref.

1894 Dispersed-Phase Holdup in Packed, Countercurrent Liquid-Liquid Extraction Columns. C. E. Wicks and R. B. Beckmann. *A.I.Ch.E. Journal*, v. 1, Dec. 1955, p. 426-433.

Effect of flow rates, packing size, and column diameter on the holdup of a toluene dispersed phase, flowing countercurrent to a continuous water phase in liquid-liquid extraction columns. Diagrams, tables, graphs. 11 ref.

1895 Automatic Control of Batch Processes. W. A. Goldstein. *Canadian Chemical Processing*, v. 39, Dec. 1955, p. 67, 71-73.

A discussion of the problems found in batch processes and the type of control equipment employed. Diagrams.

1896 Loading and Washing in Basket Centrifugals. J. A. Schneider. *Chemical Engineering Progress*, v. 51, Dec. 1955, p. 555-556.

Discusses the major mechanical components of a complete centrifugation operation. Diagrams.

1897 The Effect of a Surface-Active Agent on Mass Transfer in a Stirred Liquid-Liquid Extractor. A. Holm and S. G. Terjesen. *Chemical Engineering Science*, v. 4, Dec. 1955, p. 265-268.

The effect has been observed of small additions of sodium oleyl-p-anisidinesulphonate on the rate of extraction of iodine from aqueous solutions with carbon tetrachloride in an agitated extractor. Diagram, graphs. 5 ref.

1898* Filtration. I. Fundamental Investigations. H. K. Suttle. *Chemical & Process Engineering*, v. 36, Dec. 1955, p. 429-431.

Removal of solids from liquids by the conventional method and also the removal of airborne dust and aerosols. Photographs. 26 ref.

1899* Processing Mineral Oil in the Scholven 300 Atmosphere. Kombi Hydrogenation Chamber. **Erdölverarbeitung in der Scholvener 300 at-Kombi-Hydrierkammer.** (German.) Wilhelm Urban. *Erdöl und Kohle*, v. 8, no. 11, Nov. 1955, p. 780-782; disc., p. 782.

An improved process for catalytic hydrogenation with predetermined yields of gasoline, diesel oil, and generator gas. Tables, graphs, diagrams. 4 ref.

1900 The Design of Mixers. William C. Peck. *Industrial Chemist and Chemical Manufacturer*, v. 31, Dec. 1955, p. 593-597.

Essentials for efficient design and characteristics of various types of equipment used in industry. Diagrams, photographs.

1901 A Guide to Industrial Filtration. Christopher J. Pratt. *Industrial Chemist and Chemical Manufacturer*, v. 31, Dec. 1955, p. 607-613.

Reviews the types of equipment now in use and discusses the selection of correct filter media for various applications. Tables. 2 ref.

1902 Four Inorganic Papers. Thomas D. Callinan. *Materials & Methods*, v. 42, Dec. 1955, p. 98-101.

Discusses papers made from asbestos, mica, glass, and ceramics such as aluminum silicate and silica. Principal uses are in electrical and electronic parts, reinforced plastics, filters, and high-temperature parts. These papers are compared with cellulose papers as to properties and cost. Photographs, table.

1903* Production of "Heurtane"—Industrial Gas. **Le gaz "Heurtane" et sa production industrielle.** (French.) Louis Gagnaire. *Métallurgie et la construction mécanique*, v. 87, no. 11, Nov. 1955, p. 911-913, 915.

Process and layout for a generator gas with a cal. value of 1700 cal. per cu. m. and thermal yield of 67.5%. Graphs, diagrams, photographs.

1904* Thermionic Emission of Silicate and Alumosilicate Ion-Exchangers. **O termoionnoi emissii silikatnykh i aliumosilikatnykh ionoobmennikov.** (Russian.) G. M. Panchenkov, P. A. Akishin, and N. N. Vasil'ev. *Moskovsogo universiteta, vestnik, seriia fiziko-matematicheskikh i estestvennykh nauk*, v. 10, no. 8, Aug. 1955, p. 3-15.

Cracking rate constants for cetane on alumosilicates of varying composition. Effect of heating time of alumosilicate at 550 C on intensity and steadiness of ion emission. Graphs, tables. 51 ref.

Books and Miscellaneous Publications

1905 Reports on the Progress of Applied Chemistry, v. XXXIX. 1125 p. 1954. Society of Chemical Industry, London. (TP1 So13r)

Reviews chemical developments in 1954 to include metallurgy, fuels, biology, textiles, plastics, and food. Pertinent papers are abstracted separately.

See also: **2155** (economics in chemical engineering).

CHEMISTRY—ANALYTICAL AND INORGANIC

1906 The Determination of Lead in Organic Material. J. C. Gage. *Analyst*, v. 80, Nov. 1955, p. 789-796.

A simplified standardized procedure for the determination of traces of Pb in a wide variety of organic materials and organic matter is rapidly destroyed by dry-heating in the presence of nitric acid vapor. Lead is separated as diethyldithiocarbamate into an organic solvent and extracted therefrom into dilute acid. Diagram, tables. 9 ref.

1907 An Improved Barium Sulphate Method for the Determination of Sulphur in Steel. B. Bagshawe and A. L. Pill. *Analyst*, v. 80, Nov. 1955, p. 796-802.

Modified and simplified procedure in which hydroxylamine hydrochloride is used to decompose residual nitrate. This modified procedure is applicable, without loss of accuracy, in all ranges of Cr content and to all classes of highly alloyed steel, with the exception of steels of high Ti content. The precision of determination is within 0.002% of S in all normal S ranges. Tables. 4 ref.

1908 A New Titrimetric Method for the Determination of Ascorbic Acid. M. Z. Barakat, S. K. Shehab, and M. M. El-Sadr. *Analyst*, v. 80, Nov. 1955, p. 828-833.

Includes tables. 21 ref.

1909 Type Carbon Atom Analysis of Heavy Hydrocarbon Products. Simon Miron. *Analytical Chemistry*, v. 27, Dec. 1955, p. 1947-1956.

A method is described for determining the percentages of aromatic, naphthenic, and alkyl carbon atoms in hydrocarbon products having mol. wt. above 150. Tables, graph. 34 ref.

1910 Colorimetric Determination of Molybdenum in Tungsten-Bearing Steels. Lewis J. Wrangell, Edward C. Bernam, Donald F. Kuemmel, and Origen Perkins. *Analytical Chemistry*, v. 27, Dec. 1955, p. 1966-1970.

Results are shown for W-bearing standards and mixtures of standards which contain maxima of approximately 9% Mo, 18% W, 19% Cr, and 5% Co. Included are results for a no. of compositions which simulate various trade steels. Tables, graphs. 10 ref.

1911 Methods for Measuring the Hydrogen Content of Weld Metal. P. D. Blake. *British Welding Journal*, v. 2, Dec. 1955, p. 558-561.

Description of laboratory methods for measuring the diffusible and residual H contents of ferrous weld metal. These two values can be determined separately by collecting the diffusible H under Hg at room temperature and subsequently extracting the residual H by vacuum heating; alternatively, the total H may be determnied in a single step by vacuum heating. Diagrams.

1912 The Preparation and Properties of Some Plutonium Compounds. I. Plutonium Hydride. F. Brown, Heather M. Ockenden, and G. A. Welch. *Chemical Society, Journal*, 1955, Nov., p. 3932-3936.

Plutonium hydride with the approximate composition $PuH_{2.7}$ has been obtained by direct combination of the metal with pure H at temperatures between 150 and 250 C. Its chemical properties have been found to be very similar to those of the metal. Tables, graph.

1913 The Polonium Halides. II. Bromides. K. W. Bagnall, R. W. M. D'Eye, and J. H. Freeman. *Chemical Society, Journal*, 1955, Nov., p. 3959-3963.

The crystal structures of the tetrabromide, ammonium and caesium hexabromopolonite, and caesium hexabromotellurite have been determined. Tables.

1914* Analysis of Vegetable Oils by Infra-Red Absorption. **Analyse des matières grasses végétales par absorption infrarouge.** (French.) Alain Berton. *Comptes rendus*, v. 241, no. 19, Nov. 7, 1955, p. 1291-1293.

Description of a new method, and a newly developed photometer. Operating instructions and fields of application. 6 ref.

1915 Theory of Chromatography. X. Formulae for Diffusion Into Spheres and Their Application to Chromatography. E. Glueckauf. *Faraday Society, Transactions*, v. 51, Nov. 1955, p. 1540-1551.

Includes tables, graphs. 9 ref.

1916 Titrimetric Determination of Zirconium. M. O. Fulda and J. S. Fritz. *Iowa State College, Ames Laboratory (U. S. Atomic Energy Commission)*, ISC-596, Mar. 1955, 24 p. (UF767 Un3.1is)

Brief literature survey of gravimetric, colorimetric, volumetric, and spectrographic methods. Tables. 68 ref.

1917 Spectrographic Determination of Residual Elements in Steel. *Iron and Steel Institute, Journal,* v. 181, Dec. 1955, p. 316-318.

Method for the determination of V, Mo, Co, Sn, and Ti, using a low-voltage intermittent-arc source unit. Diagrams, tables. 7 ref.

1918* Determination of Magnesium in Nodular Cast Iron by Spectrographic Analysis. B. C. Kar and M. K. Gupta. *Journal of Scientific & Industrial Research,* v. 14, sec. B, Nov. 1955, p. 570-572.

Determination of small amounts by a spectrochemical method using standard metal electrodes. Graph, tables. 2 ref.

1919 Determination of Carbon in Uranium Tetrafluoride. Edward H. Van Kooten and Ross D. Gardner. *Los Alamos Scientific Laboratory, University of California (U. S. Atomic Energy Commission),* LA-1947, Nov. 1955, 23 p. (UF767 U3La)

Procedure is described wherein C in UF_4 is determined quantitatively by burning the sample in a stream of O at a temperature of 1100 to 1200 C. Diagram, tables. 7 ref.

1920 Chemical Analysis of Plating Solutions. Nathaniel Hall. *Metal Finishing (Guidebook–Directory Ed.),* 1956, p. 509-525. (T13 M56f)

Simple, accurate, and rapid analytical methods adaptable for most all plating room control.

1921 The Application of Spectrographic Solution and Powder Methods to the Analysis of Miscellaneous Samples. P. T. Beale and Daphne A. Poynter. *Metallurgia,* v. 52, no. 313, Nov. 1955, p. 253-261.

Practical experiences, with various techniques and specific applications, are given of several methods. Diagrams, tables. 16 ref.

1922* Strontium and Barium in Plants and Soils. H. J. M. Bowen and J. A. Dymond. *Royal Society, Proceedings,* v. 144, ser. B, Nov. 29, 1955, p. 355-368.

Method for the determination of Sr and Ba in plants and soil extracts, using the technique of activation analysis. The method was applied to determine the available alkaline earth contents of nine English soils, including two rich in Sr, and of the plants growing on them. Tables, graphs. 37 ref.

1923 Methods for Analyzing Titanium Sponge and Intermediate Products. P. R. Perry, R. W. Lewis, and T. A. Sullivan. *U. S. Bureau of Mines, Report of Investigations* 5168, Oct. 1955, 45 p. (TN21 Un3r)

Concise compilation of tested chemical and spectrochemical procedures. Tables, graphs, diagrams, photograph. 16 ref.

1924* Carbon in Non-Ferrous Metals. **Der Kohlenstoff in Nichteisenmetallen. I.** Determination. **Bestimmungsverfahren.** (German.) Joseph Fischer and Walter Schmidt. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 8, no. 11, Nov. 1955, p. 529-532.

Analysis of C in steels is adapted to non-ferrous metals, with respect to pH-measurement. Graph, diagram. 2 ref.

Books and Miscellaneous Publications

1925 Chromatography. Edgar Lederer and Michael Lederer. 460 p. 1955. Elsevier Publishing Co., New York. (QD271 L49c)

A review of principles and applications developed in the last 10 to 12 years. Distinguishes between absorption-, ion exchange-, and partitionchromatography.

1926 Chemical and Spectrographic Analysis of Magnesium and Its Alloys. A. Mayer and W. J. Price. Sections individually paged. 1954. Magnesium Elektron Ltd., Manchester, England. (TN799.M2 M45c)

A compilation of recommended analytical procedures including chemical and physico-chemical methods and the theory and practice of spectrographic analysis.

See also: **2234** (gas analysis); **2732** (analysis of copolymers).

CHEMISTRY—ORGANIC

1927 Reactions of Orthoesters With Ureas. II. Calvert W. Whitehead and John J. Traverso. *American Chemical Society, Journal,* v. 77, Nov. 20, 1955, p. 5872-5877.

Reaction sequences were dependent upon the nature and position of substituents on the urea, the particular orthoester, and reaction conditions. About 40 compounds are reported. Tables. 18 ref.

1928 Ring Enlargements. IV. Steric Influence in Diazomethane-Carbonyl Reactions. The Reaction of *cis*- and *trans*-α-Decalone With Diazomethane. C. David Gutsche and Hugo H. Peter. *American Chemical Society, Journal,* v. 77, Nov. 20, 1955, p. 5971-5977.

Includes tables. 30 ref.

1929 The Reaction of Oxygen With Organometallic Compounds. A New Synthesis of Hydroperoxides. Cheves Walling and Sheldon A. Buckler. *American Chemical Society, Journal,* v. 77, Nov. 20, 1955, p. 6032-6038.

Hydroperoxides are prepared in good yield (30 to 90%) by the slow addition of Grignard reagents to O-saturated solvents at about −70 C. Tables. 41 ref.

1930 Reduction of Organic Compounds by Lithium in Low Molecular Weight Amines. III. Reduction of Aromatic Compounds Containing Functional Groups. Robert A. Benkeser, Charles Arnold, Jr., Rogers F. Lambert, and Owen H. Thomas. *American Chemical Society, Journal,* v. 77, Nov. 20, 1955, p. 6042-6045.

Compounds are reduced by Li in methyl- and ethylamine. Table. 26 ref.

1931 The Radical-Sensitized Decomposition of Formaldehyde. James E. Longfield and W. D. Walters. *American Chemical Society, Journal,* v. 77, Dec. 5, 1955, p. 6098-6103.

Decomposition of formaldehyde was sensitized by the addition of small percentages of ethylene oxide. Tables, graphs. 16 ref.

1932 Derivatives of Dicyclopentadienyliron. F. S. Arimoto and A. C. Haven, Jr. *American Chemical Society, Journal,* v. 77, Dec. 5, 1955, p. 6295-6297.

Syntheses and properties of the amino, vinyl, and related derivatives of dicyclopentadienyliron are described. Diagrams, table.

1933 Polysubstituted Cyclohexanes. The Synthesis of 9-Hydroxy-2-azabicyclo [3.3.1] nonane. Fausto Ramirez and John W. Sargent. *American Chemical Society, Journal,* v. 77, Dec. 5, 1955, p. 6297-6306.

Preparation of trans-cis- and cis-cis-ethyl 3-amino-2-hydroxycyclohexeanacetate from 2-carbethoxy-cyclohexanone and the synthesis of an isomer of 9-hydroxy-2-axabicyclo [3.3.1] nonane. Diagram, table, charts. 33 ref.

1934 The Synthesis of Pteroylglutamic Acid. M. Sletzinger, D. Reinhold, J. Grier, M. Beachem, and M. Tishler. *American Chemical Society, Journal,* v. 77, Dec. 5, 1955, p. 6365-6367.

Excellent yields of high purity pteroylglutamic acid derivatives result from the condensation of 2-acetamido-4-hydroxy-6-formylpteridine and p-amino-benzoylglutamic acid in the presence of either formic acid or thiocresol. All the intermediates of this series are highly crystalline and are easily purified by recrystallization from polar solvents. These intermediates are readily converted to pure pteroylglutamic acid by basic hydrolysis. 6 ref.

1935 Reactions of Fatty Materials With Oxygen. XX. Recent Developments in the Autoxidation of Methyl Oleate and Other Monounsaturated Fatty Materials. Daniel Swern and Joseph E. Coleman. *American Oil Chemists' Society, Journal,* v. 32, Dec. 1955, p. 700-703.

Reviews and evaluates significant developments since 1947. Discusses preparation and characterization of hydroperoxides, and mechanism, kinetics, and secondary products of autoxidation. 73 ref.

1936 Application of Infrared Spectrophotometry to Fatty Acid Derivatives. Robert T. O'Connor. *American Oil Chemists' Society, Journal,* v. 33, Jan. 1956, p. 1-15.

Relationships between infra-red spectroscopy and the fatty acid chemist by showing what infra-red spectroscopy is doing in fatty acid chemistry with same postulation as to what might be expected in the immediate future. Tables. 127 ref.

1937 Researches on Acetylenic Compounds. LI. The Syntheses of γ-Methyleneglutamic Acid and γ-Methyleneglutamine. P. C. Wailes and M. C. Whiting. *Chemical Society, Journal*, 1955, Nov., p. 3636-3641.

The structures proposed are confirmed by rational syntheses of the racemic acids. The routes employed render these substances readily accessible. Graph.

1938* A New Synthesis of Polyacetylene Compounds Coupled Symmetrically and Assymmetrically. **Nouvelle synthèse de composés polyacétyléniques conjugués symétriques et dissymétriques.** (French.) Wladyslaw Chodkiewicz and Paul Cadiot. *Comptes rendus*, v. 241, no. 16, Oct. 17, 1955, p. 1055-1057.

Description of the method of syntheses. Chemical constants of intermediate products. Table. 7 ref.

1939* Catalytic Polymerization of Propene. **Katalytische Polymerisation von Propen.** (German.) A. Petrow. *Fette, Seifen, Anstrichmittel*, v. 57, no. 10, Oct. 1955, p. 798-799.

Zinc chloride polymerization leads to more branched products than with the use of phosphoric acid. The nonene fraction is studied. Infra-red spectra. 5 ref.

1940 Aromatic Substitution by Free Radicals. Peter F. Nelson. *Journal of Chemical Education*, v. 32, Dec. 1955, p. 606-610.

Investigations upon orientation and reaction rates on homolytic substitution. Tables. 30 ref.

1941 The Beckmann Rearrangement of Ketoximes With Boron Fluoride. Development of the Thory and of a New Method. Charles R. Hauser and David S. Hoffenberg. *Journal of Organic Chemistry*, v. 20, Nov. 1955, p. 1482-1490.

Boron fluoride was found to convert benzophenone oxime and its O-methyl ether to relatively stable N-coordination complexes which underwent the Beckmann rearrangement only at 125 to 150 C. Table. 29 ref.

1942 Dehydration or Beckmann Rearrangement of Aldoximes With Boron Fluoride. Conversion of Aldoximes to Corresponding Amides. David S. Hoffenberg and Charles R. Hauser. *Journal of Organic Chemistry*, v. 20, Nov. 1955, p. 1496-1500.

It was found that, although relatively stable, complex I undergoes dehydration or Beckmann rearrangement at 150 C or 115 to 120 C in acetic acid solution. Table. 13 ref.

1943 Preparation of Titanium Tetrachloride of High Purity. W. Stanley Clabaugh, Robert T. Leslie, and Raleigh Gilchrist. *Journal of Research, National Bureau of Standards*, v. 55, Nov. 1955, p. 261-264.

Procedures are given for determining purity by cryoscopic, spectrochemical, and infra-red absorption measurements. Tables. 29 ref.

1944* Our Contemporary Knowledge of the Collagens. **Unsere heutige Kenntnis des Kollagens.** (German.) W. Grassmann. *Leder*, v. 6, no. 10, Oct. 1955, p. 241-261.

Review of callagen chemistry with respect to the leather industry. Tables, diagrams, micrographs, graphs. 103 ref.

1945* Reaction of Iodine and Long-Chain Free Radicals as a Result of Supersonic-Wave Decomposition of Polymethyl Methacrylate. **Die Reaktion von Jod mit langkettigen freien Radikalen, die durch Ultraschall-Abbau des Polymethacrylsäuremethylesters entstehen.** (German.) Arnim Henglein. *Zeitschrift für Naturforschung*, v. 10b, no. 11, Nov. 1955, p. 616-622.

Discusses the reaction with respect to degree of polymerization of polymethyl methacrylate and the concentration of I. Tables. 15 ref.

1946* Photochemical Dissociation of Organic Hydroperoxides. **Fotokhimicheskoe razlozhenie organicheskikh gidroperekisei.** (Russian.) A. V. Kariakin, V. A. Nikitin, and A. N. Sidorov. *Zhurnal fizicheskoi khimii*, v. 29, no. 9, Sept. 1955, p. 1624-1633.

A study of the characteristics of products obtained in the dissociation of vapors. Table, ultra-violet spectra, infra-red spectra. 13 ref.

1947* Low-Temperature Investigation of the Structure of Aromatic Compounds. **Nizkotemperaturnye issledovaniia struktury aromaticheskikh soedinenii. III.** Crystal and Molecular Structure of Naphthalene. **Kristallicheskaia i molekuliarnaia struktura naftalina.** (Russian.) V. M. Kozhin and A. I. Kitaigorodskii. *Zhurnal fizicheskoi khimii*, v. 24, no. 10, Oct. 1955, p. 1897-1908.

Coordinates of atoms and atomic functions for temperatures of −195 and +20 C. The analysis of inter-atom spacing shows that contraction of the nucleus is caused by a change of distances between different molecules. Tables, diagrams. 5 ref.

1948* Snythesis of Some Fluorine Derivatives of Phenazine, Azobenzene, and Diphenylamine. **Sintez nekotorykh ftorproizvodnykh fenazina, azobenzola i difenilamina.** (Russian.) V. P. Chernetskii, L. M. Iagupol'skii, and S. B. Serebrianyi. *Zhurnal obshchei khimii*, v. 25, no. 11, Oct. 1955, p. 2161-2170.

Includes tables. 14 ref.

1949* Complex Lithium-Aromatic Compounds. **O kompleksnykh litiiaromaticheskikh soedineniiakh.** (Russian.) N. G. Chernova and B. M. Mikhailov. *Zhurnal obshchei khimii*, v. 25, no. 12, Nov. 1955, p. 2280-2285.

6 ref.

1950* Mechanism of Alcoholysis of Vegetable Oils. **K mekhanizmu alkogoliza rastitel'nykh masel.** (Russian.) E. E. Shkol'man, I. I. Zeidler, and N. M. Voroshilova. *Zhurnal prikladnoi khimii*, v. 28, no. 11, Nov. 1955, p. 1190-1198.

Effect of temperature, time, and various catalysts on degree of glycerolysis of linseed and other oils. Graphs, tables. 10 ref.

1951* Problems in the Application of Diene Synthesis With Maleic Anhydride. **K voprosu primeneniia reaktsii dienovogo sinteza s maleinovym angidridom.** (Russian.) G. A. Rudakov and M. M. Shestaeva. *Zhurnal prikladnoi khimii*, v. 28, no. 11, Nov. 1955, p. 1199-1204.

Physical properties of terpenes and their solutions before and after treatment with maleic anhydride at room temperature. Tables. 6 ref.

See also: **2010** (dicyclopentadiene copolymers).

CHEMISTRY—PHYSICAL

1952* Surface Energy of Excited Atomic Nuclei. **Die Oberflächenenergie Angeregteratomkerne.** (German.) G. Marx and G. Szamosi. *Acta Physica Academiae Scientiarum Hungaricae*, v. 5, no. 2, 1955, p. 189-198.

Temperature dependence of surface energy of atomic nuclei. Application of statistical methods of Born and Courant concerning the surface tension of liquids. Tables. 13 ref.

1953 Radiolysis of Aqueous Solutions of Hydrazine. H. A. Dewhurst and Milton Burton. *American Chemical Society, Journal*, v. 77, Nov. 20, 1955, p. 5781-5785.

Air-free hydrazine solutions are irradiated with Co^{60} at room temperature. Graphs. 28 ref.

1954 The Reactions of Atomic Hydrogen With Ozone and With Oxygen. J. D. McKinley, Jr. and David Garvin. *American Chemical Society, Journal*, v. 77, Nov. 20, 1955, p. 5802-5805.

Studied at room temperature in a low pressure flow system.

Products are isolated in a liquid N trap where most of the radical recombination occurs. Tables. 22 ref.

1955 The Iodide-Iodine-Triiodide Equilibrium and Ion Activity Coefficient Ratios. Leonard I. Katzin and Elizabeth Gebert. *American Chemical Society, Journal*, v. 77, Nov. 20, 1955, p. 5814-5819.

The dissociation constant is determined at 20, 25, and 30 C by measuring the solubility of iodine in iodide solutions. Tables. 28 ref.

1956 Anion-Exchange Studies. II. The Effect of Cross-Linkage on the Elution of Several Transition Elements. Rolfe H. Herber, Kayacan Tonguc, and John W. Irvine, Jr. *American Chemical Society, Journal*, v. 77, Nov. 20, 1955, p. 5840-5843.

Samples of Dowex-1 were studied relative to their behavior with Mn(II), Co(II), Cu(II), and Zn(II) in HCl. Table, graphs, diagram. 16 ref.

1957 A Remeasurement of the Self-Diffusion Coefficients of Sodium Ion in Aqueous Sodium Chloride Solutions. Reginald Mills. *American Chemical Society, Journal*, v. 77, Dec. 5, 1955, p. 6116-6119.

New diffusion apparatus for measuring the self-diffusion coefficients. By proper selections of flow rate over the capillaries, a series of coefficients for the ion have been evaluated. Measurements of the coefficients using the diaphram cell method have been extended and subjected to additional tests in the high concentration region. Tables. 11 ref.

1958 A Laboratory Method for Separating Nitrogen Isotopes by Ion Exchange. F. H. Spedding, J. E. Powell, and H. J. Svec. *American Chemical Society, Journal*, v. 77, Dec. 5, 1955, p. 6125-6132.

Includes graphs. 7 ref.

1959 Preparation of a Strontium-Niobium Bronze With the Perovskite Structure. Dana Ridgley and Roland Ward. *American Chemical Society, Journal*, v. 77, Dec. 5, 1955, p. 6132-6136.

Study of the ternary oxide system of Sr and Nb revealed the existence of a cubic phase of the Perovskite type which possesses the characteristics of the W bronzes. Tables, graph. 16 ref.

1960 Radiochemically Pure Cerium. New Specification of Chemical Purity. Murrell L. Salutsky, H. W. Kirby, and Laurence L. Quill. *Analytical Chemistry*, v. 27, Dec. 1955, p. 1960-1962.

Radiochemically pure Ce, as a carrier for tri- and quadri-valent ions in extremely low level radiochemical analyses, was prepared by fractional preciptation of the iodate from homogeneous solution, and by fractional crystallization of the double magnesium nitrate and of ceric ammonium nitrate. Tables, graphs, diagram. 5 ref.

1961 The Thermal Conductivity of Liquid and Gaseous Oxygen. H. Ziebland and J. T. A. Burton. *British Journal of Applied Physics*, v. 6, Dec. 1955, p. 416-420.

Using a vertical coaxial cylinder method, the conductivity was measured between 80 and 200 K and between 1 and 130 atmospheres of pressure. Diagrams, tables, graph. 13 ref.

1962 Ion Exchange in the Fine Chemicals Industry. James Gillin. *Chemical Engineering Progress*, v. 51, Dec. 1955, p. 547-550.

Illustrates a number of ways ion exchange may be used in the chemical industry and suggest applications in other fields. Diagram, graphs, table. 5 ref.

1963 Exchange Reactions of Solid Oxides. VII. Chromic Oxide, Nickel Oxide, and Ferric Oxide. E. R. S. Winter. *Chemical Society, Journal*, 1955, Nov., p. 3824-3834.

The dependence of the semiconductivity of the oxides upon O pressure and upon the degree of outgassing has been studied. Tables, graphs.

1964 The Oxides of Uranium. VII. The Oxidation of Uranium Dioxide. J. S. Anderson, L. E. J. Roberts, and E. A. Harper. *Chemical Society, Journal*, 1955, Nov., p. 3946-3959.

Uranium dioxide is oxidized by two distinct processes in the temperature ranges −130 to 50 and 130 to 180 C, though in each case O is absorbed into interstitial positions in the lattice. Tables, graphs.

1965* Present Ideas on the Structure of Nitric Acid and the Composition of Its Solutions. **Ideas actuales sobre la arquitectura del acido nitrico y la constitucion de sus soluciones.** (Spanish.) Modesto Bargalló. *Ciencia y tecnologia*, Jan.-Mar. 1955, p. 13-24.

Verification of the existence of the OH group or the NO_2OH molecule in nitric acid; structure of the NO_2OH molecule, and the composition of anhydrous crystallized nitric acid and the crystallized hydrates of the nitric acid. Diagrams. 101 ref.

1966* **The Crystal Chemistry of Non-Stoichiometric Compounds.** A. D. Wadsley. *Reviews of Pure and Applied Chemistry*, v. 5, Sept. 1955, p. 165-193.

Examines structural changes accompanying departures from ideal composition, and discusses ordering of defects, crystalline solids, substitutional and interstitial systems, and tunnel and layer-compounds. Diagrams, tables. 184 ref.

1967* Mechanism of Electro-Reduction of Anions on a Mercury Electrode. **O mekhanizme elektrovosstanovleniia anionov na rtutnom elektrode.** (Russian.) G. M. Florianovich and A. N. Frumkin. *Zhurnal fizicheskoi khimii*, v. 24, no. 10, Oct. 1955, p. 1827-1846.

Evaluation of the reduction of ferri-cyanide, MnO_4, $IrCl_6$, $RhCl_6$, and HgI_4. Diagram, graphs, table. 34 ref.

1968* Molecular Weight of Some Complex Compounds of Titanium Tetrachloride. **O molekuliarnom vese nekotorykh kompleksnykh soedinenii chetyrekhkhloristogo titana.** (Russian.) O. A. Osipov and A. D. Semenov. *Zhurnal obshchei khimii*, v. 25, no. 11, Oct. 1955, p. 2059-2062.

Includes tables, graph. 9 ref.

Books and Miscellaneous Publications

1969 Advances in Catalysis. W. G. Frankenburg, V. I. Komarewsky, and E. K. Rideal, editors. v. VII. 362 p. 1955. Academic Press, New York. (QD501 A95c)

Eight papers covering the electronic factor and compensation effect in and application of semiconductors to heterogeneous catalysis; chemisorption and catalysis on oxide semiconductors; application of field emission microscopy; adsorption on metal surfaces; surface barrier effects in adsorption; electronic interaction between catalysts and chemisorbed molecules.

1970* **Tables of Thermal Properties of Gases.** Joseph Hilsenrath, Charles W. Beckett, William S. Benedict, Lilla Fano, Harold J. Hoge, Joseph F. Masi, Ralph L. Nuttall, Yeram S. Touloukian, and Harold W. Woolley. National Bureau of Standards Circular 564. 488 p. 1955. Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. (QC286 Un3.5t)

Tables of thermodynamic and transport properties of air, A, CO_2, CO, H, N, O, and steam.

See also: **2026** (oxygen transfer in electrolytic layers); **2699** (luminescence of naphthalene).

COATINGS

1971* Flame-Sprayed Light Metal Bearings. **Flammgespritzte Leichtmetallager.** (German.) G. Vogelpohl, A. Matting, and K. F. Hahn. *Aluminium*, v. 31, no. 11, Nov. 1955, p. 544-553.

Practical application of fused light metal spraying for plain bearing production. Photographs, graphs, tables, diagrams, micrographs. 21 ref.

1972 Vacuum Metallizing—Modern Midas Touch. Robert N. Sheets and William M. Stocker, Jr. *American Machinist*, v. 99, Dec. 19, 1955, p. 105-108.

Discusses use in manufacture of plastic toys, electronic equipment, automotive accessories, household appliances, business machines, and decorative papers. Photographs.

1973 The Chemistry of Driers. IV. William Brushwell. *American Paint Journal*, v. 40, Dec. 19, 1955, p. 82 + 8 pages.

Discusses acids used, physical properties of various commercial driers, mechanism of drier action, and formulation in relation to vehicle employed. Tables. 3 ref.

1974 The Deposition of Thin Films of Gold on Cylindrical Specimens by Sputtering. F. R. Lipsett. *British Journal of Applied Physics*, v. 6, Dec. 1955, p. 442-444.

Apparatus and procedure for Au deposition on Cd wires of 1 mm. diameter. Diagram, table. 3 ref.

1975 The Protection of Structural Steel. Physical Examination of Paints in Relation to Their Practical Performance. H. W. Talen. *Chemisrty & Industry*, 1955, no. 49, Dec. 3, p. 1564-1574.

Results of investigations relating to the effect of weathering on a number of paints. Diagrams, graphs, tables. 4 ref.

1976 The Protection of Structural Steel. Long-Time Tests Carried Out by the Swedish Committee on Corrosion With Painted and Galvanized Steel Plates Exposed to Air. P. Nylén and K. F. Trägårdh. *Chemistry & Industry*, 1955, no. 49, Dec. 3, p. 1574-1587.

Reports test methods and results. Effects of methods of application, pretreatment, and galvanizing procedures. Map, tables, micrographs, graphs. 3 ref.

1977 The Protection of Structural Steel. I-II. Practical Experience of Protection by Sprayed Metal Coatings. W. E. Ballard and F. A. Rivett. *Chemistry & Industry*, 1955, no. 50, Dec. 10, p. 1606-1615.

General discussion on the techniques of applying Zn and Al coatings for maximum possible protection. Photographs, table.

1978 The Protection of Structural Steel. The Use and Weldability of Aluminum Sprayed Steel. H. F. Tremlett and W. A. Johnson. *Chemistry & Industry*, 1955, no. 50, Dec. 10, p. 1616-1617.

Precautions necessary with Al coated steels in regard to welding operations. Table. 4 ref.

1979 The Protection of Structural Steel. The Protection of Steelwork in Chemical Factories. F. R. Himsworth. *Chemistry & Industry*, 1955, no. 50, Dec. 10, p. 1618-1622.

Considers painting, sprayed metal coatings, and other forms of protection, and the economic considerations involved. Table.

1980 Tentative Recommended Specifications and Practices for Coal Tar Coatings for Underground Use. *Corrosion*, v. 12, Jan. 1956, p. 75-76.

Coating requirements; coal tar primer and enamels; applications of coal tar coatings to pipe. Table.

1981 Nickel Plating by Direct Chemical Deposition. *Corrosion Technology*, v. 2, Dec. 1955, p. 377-379.

A more flexible and direct method of plating by chemical deposition from appropriate solutions. Its main features are superior corrosion resistance to normal electroplating and extreme simplicity, since no electrical equipment is needed; however, it is not quite as economical as electroplating. Photograph. 9 ref.

1982 Electroless Nickel Plating and Its Applications. Bosdorf. *Electroplating and Metal Finishing*, v. 8, Dec. 1955, p. 415-417, 428.

Process in an acid and alkaline solution is based on $NiCl_2$ and sodium hypophosphite. Rate of deposition is a function of time in both solutions, and deposit thickness increases with increase in Ni or hypophosphite up to a limiting value. Tables, graphs, photographs, micrographs. 5 ref.

1983 The Protective Value of Paints on Steel. *Electroplating and Metal Finishing*, v. 8, Dec. 1955, p. 426-428.

Tests were conducted on 250 paints in industrial and marine atmospheres. Covers priming paints, metallic pigments and Pb soaps in primers, effect of surface preparation and metallic coatings on paint systems, tar, and bitumen paints.

1984* Porcelain Enameled Aluminum. *Foote Prints*, v. 27, no. 2, 1955, p. 3-7.

Basic manufacturing principles, advantages, and uses. Photographs.

1985* Metallurgical Remarks on the Production and the Use of Preserve Tins. **Hutnické poznámky k výrobě a použiti konservových krabic.** (Czech.) Josef Teindl and Dagmar Zajoncová. *Hutnické listy*, v. 10, no. 11, Nov. 1955, p. 654-662.

Discussion of factors causing defects in Sn cans, including coating, thickness variation, metal purity, desire to conserve Sn supplies, and soldering factors. Dependence of coating adherence on Fe-Sn intermediate layer. Diagrams, tables, micrographs. 23 ref.

1986* Electrodeposition of Tin and Tin Alloys. R. M. Angles. *Industrial Finishing (London)*, v. 9, Nov. 1955, p. 202 + 5 pages.

Uses of Sn and its applications in the preparation of alloys, and its usefulness as a protective coating in industry. Diagram, photographs, table.

1987* Metallic Coatings on Non-Metallic Materials. V. Metallic Paints. *Industrial Finishing (London)*, v. 9, Nov. 1955, p. 214, 216, 218, 220.

Methods of metallizing glass, ceramics, and similar materials. Also considers the way in which the application and firing of metallic paints have been stimulated by the development of new uses in radio and electronics. Table.

1988* Bituminous Paints Prove Their Worth by Achieving a High Waterproof Finish. *Industrial Finishing (London)*, v. 9, Nov. 1955, p. 228, 230.

Includes micrographs, photograph. 1 ref.

1989* Metallization. **Metalizacion.** Salvador Mariá Checa Casajús. *Instituto del hierro y del acero*, v. 8, no. 38, July-Sept. 1955, p. 374-383.

Equipment, methods of surface preparation, metallization process, mechanical properties of coatings, applications, and defects. Diagrams, photographs, micrographs, table. 8 ref.

1990* Use of Radioactive Isotopes in the Study of the Permeability of Paint & Varnish Films. C. K. N. Nair, P. G. Sharma, and J. S. Aggarwal. *Journal of Scientific & Industrial Research*, v. 14, sec. B, Nov. 1955, p. 549-552.

Radioactive tracers provide a convenient tool in evaluating paint and varnish compositions. Rubidium-86 was used to determine the permeability of coatings by distilled and "synthetic" sea water. Tables. 4 ref.

1991 Lacquer or Enamel? John B. Campbell. *Materials & Methods*, v. 42, Dec. 1955, p. 88-92.

Choice of finish will significantly affect unit costs and performance quality. Photographs, graph. 12 ref.

1992 Sprayed Metal Coatings in Product Design. D. A. Watson. *Materials & Methods*, v. 42, Dec. 1955, p. 106-109.

Metallizing is now finding uses in original product manufacture for wear resistance, solderability, and corrosion resistance. Photographs, tables.

1993 Immersion Plating. Nathaniel Hall. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 410-413. (T13 M56f)

Formulas and bath temperatures for As, brass, Cd, Co, Cu, Au, Pb, Ni, Ag, and Sn plating on various metals. 8 ref.

1994 Electroless Nickel. Harry J. West. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 414-415. (T13 M56f)

Provides formulas for still tank and barrel operations, using acid and alkaline type solutions.

1995 Chromate Coatings. Walter E. Pocock. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 464 + 8 pages. (T13 M56f)

Outlines aids in selection and operation of suitable treatment for any given application. Tables.

1996 Chemical Conversion Coatings. S. Spring. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 477-481. (T13 M56f)

Desired characteristics and functions of phosphate coatings; types and methods of application; factors influencing crystal size; sealing and operational cycles.

1997* Study of Corrosion Stability and Wear Resistance of Calorized Steel. **Izuchenie korrozionnoi stoikosti i iznosoustoichivosti alitirovannoi stali.** (Russian.) S. G. Bogdanov. *Metallovedenie i obrabotka metallov*, 1955, no. 3, Sept., p. 225-31.

Experimental investigation of corrosion resistance of the calorized surface in acids, salt water vapors, and oxidizing atmosphere at high temperatures. Wear resistance of the calorized surface was investigated by friction with steel. Graphs, tables, diagrams, photographs. 2 ref.

1998 The Heat Resistance and Applications of Hot Dip Aluminized Steel. M. L. Hughes and D. F. G. Thomas. *Metallurgia*, v. 52, no. 313, Nov. 1955, p. 241-245.

Outlines procedure and results of heat and scaling resistance tests using steel prepared by the Aldip process.

1999* Electron Microscopy in Paint Formulation. E. G. Bobalek, L. R. LeBras, W. von Fischer, and A. S. Powell. *Official Digest. Federation of Paint and Varnish Production Clubs*, v. 27, Dec. 1955, p. 984-995.

Reports on 10 yr. research on finding techniques of electron microscopy which allow for accurate study of paint films at high magnification. Micrographs.

2000* The Influence of Fineness of Grind and Aging of Liquid Paint Upon Stress-Strain Properties of Alkyd Paint Films. Wouter Bosch and Henry Y. Wong. *Official Digest. Federation of Paint and Varnish Production Clubs*, v. 27, Dec. 1955, p. 996-1005.

Results of tests conducted on dried films of three alkyd resin paints pigmented with chrome orange, ZnO, and TiO_2. Paints were ground to increasing fineness, and aged for different lengths of time. Graphs, tables. 9 ref.

2001* Science for the Coatings Technologist. II. Pigments: General Considerations; White Pigments. E. S. Beck. *Organic Finishing*, v. 16, Dec. 1955, p. 6, 8-14.

Scientific principles, explained in a simple manner, that are encountered in organic finishing practices. Photograph, table, micrographs, graphs. (To be continued.)

2002* A Survey of Novelty Finishes. II. Harry Burrell. *Organic Finishing*, v. 16, Dec. 1955, p. 15-20.

Discusses pebble, hammer, and metallic finishes, veiling lacquers, and spatters. Materials and preparation and application methods are described. Photographs, micrographs. (To be continued.)

2003* Isocyanate Resins for Coatings. II. *Paint and Varnish Production*, v. 45, Dec. 1955, p. 25-30, 70-71.

Development and manufacture of the polyurethanes, and applications of the isocyanates; production figures and current availability. Tables. 263 ref.

2004* Catalyzed Phenolic Finishes. K. V. McCullough. *Paint and Varnish Production*, v. 45, Dec. 1955, p. 34-36.

A catalyst of phenol with a high formaldehyde content is most promising. Acids are used as catalysts. Tables. 2 ref.

2005 A Simple Coulometer Method for Tin Coating Determination. J. Monvoisin and M. Le Blanc. *Tin and Its Uses*, 1955. no. 33, p. 3-5.

Apparatus which permits the rapid measurement of free-Sn and alloyed Sn with a good degree of accuracy. Diagram, photograph. 5 ref.

2006 Hot-Tinning Cast Iron. C. J. Thwaites. *Tin and Its Uses*, 1955, no. 33, p. 5-6.

Describes a direct chloride method developed for certain high-phosphorus irons found not to be amenable to tinning by the fused chloride salt-bath method due to their susceptibility to over-treatment. It has since been found to be generally applicable to grey cast irons and has been used successfully for Meehanite and spheroidal graphite irons. Photograph.

2007 Inert-Gas Metal-Arc Welding Clads 102-in. Propeller. C. S. Sherman. *Welding Journal*, v. 34, Dec. 1955, p. 1196-1197.

Propeller company saves time, cuts cost using inert arc welding to build up Ni-V steel. Photographs.

2008 Crack Arresting by Overlays of Notch-Tough Weld Metal. P. P. Puzak and W. S. Pellini. *Welding Journal*, v. 34, Dec. 1955, p. 577S-581S.

Test results indicate that cladding of a brittle steel by such deposits imparts a high order resistance to the initiation and propagation of brittle fracture. Photographs, micrographs, graphs. 5 ref.

2009 Advantages of Phosphate Coatings in Fastener Forming. John H. Geyer and Hugh Gehman. *Wire and Wire Products*, v. 30, Dec. 1955, p. 1490-1493, 1528-1532.

The coatings have helped make practical the use of true size rod in nut forming; certain effects and benefits are realized in forming specialty bolts, screws, and rivets or in other difficult operations; extensive tool life increase is indicated. Photographs, flowsheet.

2010* New Copolymer Drying Oil. **Novaia sopolimernaia olifa.** (Russian.) A. P. Antykov. *Zhurnal prikladnoi khimii*, v. 28, no. 11, Nov. 1955, p. 1215-1219.

Physical-chemical characteristics of the dicyclopentadiene fraction, and its capacity for copolymerization with natural drying oils. Tables. 3 ref.

Books and Miscellaneous Publications

2011 Surface Coatings and Finishes. Philip L. Gordon and George J. Dolgin. 299 p. 1954. Chemical Publishing Co., New York. (TP936 G65s)

The standard methods of preparing and using the orthodox varnish vechicles, and a detailed description of the structure, use, and practical value of the plastic materials now avaiable for surface coatings.

See also: **2105** (protective coatings for steels).

CORROSION

2012* Low Alloy Steels Resisting to Stress Corrosion Cracking. (English.) *Aciers fins & spéciaux français*, 1955, no. 21, Nov., p. 29-32.

Applications for Cr-Al corrosion resistant steels are reviewed. Micrographs.

2013* Chemical Behavior of Aluminum Materials. **Das Chemische Verhalten der Aluminium-Werkstoffe.** (German.) *Aluminium Ranshofen, Mitteilungen*, v. 3, no. 2, Oct. 1955, p. 31-34.

Effect of surface conditions on corrosion protection; types of corrosion; solubility potential; corrosion under influence of different gaseous media. Tables. (To be continued.)

2014 Cathodic Protection Circuits. E. W. Schwarz and R. M. Wainwright. *Applications and Industry*, 1955, no. 21, p. 311-315.

Outlines corrosion problem along with advantages and disadvantages of present methods of attack. Purpose and implications of equivalent electric network and how it may be solved for corroding cell; use of present methods of circuit analysis to establish criterion for cathodic protection. Diagrams. 4 ref.

2015 Attach on Materials by Lead at 1000°C. W. D. Wilkinson, E. W. Hoyt, and H. V. Rhude. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5449, Oct. 1955, 30 p.

Static tests carried out on a method for determining the resistance of materials to attack by Pb at 1000 C. Tables, micrographs, diagrams. 5 ref.

2016 Induced Alternating Current Used for Cathodic Protection of a Coated Pipe Line. S. J. Bellassai. *Corrosion*, v. 12, Jan. 1956, p. 17-19.

A 5-ampere, 15-volt Se stack, 10-3-in. x 60-in. graphite rods, and 500 feet of 1/0 Cu cable provided circuit resistance of the required value to cathodically protect a coated pipe line. 1 ref.

2017 Nomograph for Corrosion Rate Calculations. Henry K. Bass, Jr. and Robert V. Andrews. *Corrosion*, v. 12, Jan. 1956, p. 20-21.

Means for determining corrosion rate in mils per yr. Nomograph. 5 ref.

2018 High Temperature Hydrogen Sulfide Corrosion. E. B. Backensto, R. D. Drew, and C. C. Stapleford. *Corrosion*, v. 12, Jan. 1956, p. 22-30; disc., p. 30-32.

Proposed methods for minimizing corrosion include: reduction of H_2S in process streams, use of chrome-Ni alloys, and protection of metals by Al coating. Micrographs, tables, photographs, graphs. 3 ref.

2019 Correlation of the Results Obtained With Corrosion Inhibitors in the Laboratory and in the Field. G. E. Purdy and William J. Reis. *Corrosion*, v. 12, Jan. 1956, p. 33-37; disc., p. 37-38.

Reviews factors influencing internal corrosion in oil wells. Field and laboratory tests with three crude oil and brine systems using two organic inhibitors were correlated. Diagram, graphs, tables. 10 ref.

2020 Inhibition of Metallic Corrosion in Aqueous Media. Harry C. Gatos. *Corrosion*, v. 12, Jan. 1956, p. 39-48.

Discusses corrosion processes from an electrochemical standpoint and organic and inorganic inhibitors. Tables, diagrams, graphs. 100 ref.

2021 The Investigation of an Unusual Cause of Shipbottom Pitting. R. P. Devoluy. *Corrosion*, v. 12, Jan. 1956, p. 49-54.

For severe corrosion to occur, the antifouling paint must be in contact with the steel hull, and the painted surface must be exposed to sulfide forming or sulfide bearing waters. Photographs, tables.

2022 Corrosion of Gasoline Engine Exhaust Valve Steels. C. H. Allen and M. J. Tauschek. *Corrosion*, v. 12, Jan. 1956, p. 55-59; disc., p. 59-62.

Method for evaluating corrosion resistance; effect of analysis variation in various alloy steels as it influences corrosion; influence of Si on corrosion; effect of a variation in Ni-Fe content on aircraft valves; use of value rotators in reducing valve corrosion. Graphs, photographs, tables.

2023 Final Report on Four Annual Anode Inspections. *Corrosion*, v. 12, Jan. 1956, p. 63-74.

Discusses data obtained from four test ground beds concerning the performance of steel, and carbon and graphite anodes in natural soils, and in carbonaceous backfill. Graphite anodes in a carbonaceous backfill gave best results. Tables, graphs.

2024 Progress Report of Task Group T-4F-1 on Water Meter Corrosion. *Corrosion*, v. 12, Jan. 1956, p. 77-80.

Identifies manner in which corrosion effects individual parts and factors contributing to corrosion. Micrographs, diagram.

2025 Corrosion Studies Aid Light Metals. Frederick W. Fink. *Corrosion Technology*, v. 2, Dec. 1955, p. 372-374.

A general discussion of the factors which have made Al, Mg, and Ti of greater industrial importance. Graphs.

2026* Mechanism of Oxygen Transfer Through Thin Electrolyte Layers. **O mekhanizme perenosa kisloroda cherez tonkie sloi elektrolitov.** (Russian.) *Doklady akademii nauk SSSR*, v. 104, no. 6, Oct. 21, 1955, p. 876-879.

Proves, by experiments, that usually irregular evaporation of electrolyte from the metal surface facilitates stirring of thin electrolyte layers. This fact results in decreasing diffusion layer thickness and in increasing O supply to the metal surface. Tables, graphs. 14 ref.

2027* Modern Stainless Steels. *Edgar Allen News*, v. 34, Dec. 1955, p. 278-279.

Corrosion resistance of British "Imperial" and "Maxilvry" stainless steels to various media. Table, photograph. (To be continued.)

2028* Corrosion and Corrosion Protection on Power-Plant Equipment. **Korrosion und Korrosionsschutz an Energieanlagen. II.** (German.) B. Müller. *Energietechnik*, v. 5 ,no. 10, Oct. 1955, p. 444-451.

Types of corrosion phenomena, on power-equipment, turbines, and related apparatuses, the use of cathodic protection. Diagrams, graphs, tables. 6 ref.

2029* Influence of Optical Whitening Agents on the Corrosion of Copper. **Zur Frage des Einflusses der optischen Aufheller auf die Korrosion des Kupfers.** (German.) O. Uhl. *Fette, Seifen, Anstrichmittel*, v. 57, no. 10, Oct. 1955, p. 793-797.

Shows no increased corrosion in the presence of optical whitening agents even with subsequent chlorine-bleaching, and treatment with thiosulfate. Tables, graphs, photographs.

2030* Some Aspects of Canning Soft Drinks. H. T. Johnson, A. W. McAlpin, and A. M. Schenck. *Food Technology*, v. 9, Dec. 1955, p. 643-647.

Factors adversely affecting shelf life are considered and development of a "Corrosivity Tester" is discussed. Graphs, table.

2031 Adapting the Static Water Drop Test to Research Methods. E. J. Schwoegler and L. U. Berman. *Lubrication Engineering*, v. 11, Nov.-Dec. 1955, p. 381-388.

Presents in detail the method of preparing specimens so that a shorter test period of 48 hr. can be used with duplicate samples. The test results are quite precise and accurate. More rapid tests are thus possible so that a large number of polar organic compounds may be evaluated in the search for optimum corrosion inhibition. Tables, photographs. 2 ref.

2032 Salt Spray Testing. G. B. Hogaboom, Jr. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 496-499. (T13 M56f)

Typically used specifications for salt spray testing.

2033* Selective Oxidation of Silver-Magnesium Alloys in Water Vapor. (English.) Masaki Hirashima. *Physical Society of Japan, Journal*, v. 10, no. 12, Dec. 1955, p. 1055-1064.

Simple method for measuring low rates of oxidation at elevated temperatures with water vapor used as oxidizing agent. It is found that the MgO layer builds up on the surface of the alloy according to a parabolic law, and the oxide growth begins to follow a linear law rather than a parabolic law at a pressure of 1 mm. Hg. Diagrams, micrographs, graphs, table. 22 ref.

2034 Corrosion of Metals. S. C. Britton. Paper from REPORTS ON THE PROGRESS OF APPLIED CHEMISTRY. v. XXXIX. p. 105-116. 1954. Society of Chemical Industry, London. (TP1 So13r)

High temperature; atmospheric; in water and underground; agents and resistant materials; inhibitors; protective coatings; and cathodic protection. 118 ref.

2035* Investigation of Fe_3O_4 Precipitation in Superficial Iron Oxidation Films at Elevated Temperatures. **Contribution a l'étude de la précipitation d'oxyde Fe_3O_4 dans les pellicules d'oxydation de fer aux temperatures élevées.** (French.) J. Païdassi. *Revue de métallurgie*, v. 52, no. 11, Nov. 1955, p. 869-886.

Relates FeO formation and Fe_3O_4 precipitation to temperature changes and heat treatments. Diagrams, micrographs, graphs. 16 ref.

2036* Corrosion of Aluminum and Its Alloys. **Korose hliniku a jeho slitin.** (Czech.) B. Puchnar. *Strojírenství*, v. 5, no. 8, Aug. 1955, p. 605-608.

Intercrystalline, spot, and uniform corrosion; effect of various metals and electric current; corrosion caused by inorganic salts, building materials, and impregnation preparations; criteria for choice of materials in contact with Al parts. Tables, diagrams.

2037* Corrosion and Materials in the Water Works Field. R. W. Henke. *Water & Sewage Works*, v. 102, Dec. 1955, p. 508-510.

Discussion of several factors involved in metallic corrosion, as a guide to combatting the condition. Diagrams, table.

2038 Stress Corrosion and Relaxation of High Carbon Steel Wire for Prestressed Concrete. Fritz Schwier. *Wire and Wire Products*, v. 30, Dec. 1955, p. 1473-1479, 1519-1521.

Tests described and results given for both drawn and oil tempered steels. Photographs, graphs. 3 ref.

Books and Miscellaneous Publications

2039 Corrosion and Protection Against Corrosion. **Korrosion und Korrosionsschutz.** (German.) Fritz Tödt. 1102 p. 1955. Walter de Gruyter & Co., Berlin. (TA462 T57k)

General, inter-crystalline and stress corrosion; corrosion of different metals; industrial problems; testing methods.

2040 Corrosion in Action. 47 p. 1955. International Nickel Company, New York. (TA462 In8c)

Discusses the nature of corrosion, anode and cathode processes, origin and characteristics of corrosion currents, and passivity and protective films.

See also: **2652** (corrosion in reactor systems).

ELECTRICAL ENGINEERING

2041 Fiber-Metallurgy—Its Use for Slip Ring Brushes. H. B. Nudelman, A. G. Metcalfe, and C. H. Sump. *Aeronautical Engineering Review*, v. 14, Dec. 1955, p. 31-32, 44.

Development of a Mo brush that helps solve the problem of brush bounce and thus reduces electrical noise in high-altitude flight. Micrograph, photograph.

2042* Short-Circuit Currents in Low-Voltage Systems. *Applications and Industry*, 1955, no. 21, Nov., p. 276-284; disc., p. 284-286.

Studies were made to permit the maximum probable short-circuit duties to be determined at nearly any point in a wide range of low-voltage electric power systems. Gives the basic assumptions and procedures used in the calculations and presents the results as a series of curves that can be used to determine short-circuit duties in the systems. Graphs, tables.

2043* System Neutral Grounding for Chemical Plant Power Systems. D. S. Brereton and H. N. Hickok. *Applications and Industry*, 1955, no. 21, Nov., p. 315-320.

Reviews various methods and suggests new ones to improve performance through grounding at all voltage levels. Diagrams, tables. 5 ref.

2044* Problems Associated With the Development of a Power System for a Manufacturing Plant. W. C. Heinz. *Applications and Industry*, 1955, no. 21, Nov., p. 335-339.

Problems evolve from the requirement that the power system be designed to satisfy the general requirements of a typical manufacturing plant in addition to furnishing power for highly specialized testing in the development laboratory. Photographs, diagram, graphs.

2045* The Converter for Flexible Power-System Interconnections. *Brown Boveri Review*, v. 42, no. 9, Sept. 1955, p. 349-369.

Interconnection of systems by means of rotary converters; in particular, with respect to a three-phase 50-c.p.s. industrial system with a single-phase 16-2/3-c.p.s. traction system. Diagrams, photographs, graphs, tables. 15 ref.

2046* Two Curves Simplify Battery Life Tests. K. A. Vaughan. *Electrical World*, v. 144, Dec. 26, 1955, p. 85, 90.

Specific gravity and temperature charts facilitate life tests, no longer requiring adjustment of electrolyte to 1.275 sp. gr. Graphs.

2047 Gas Tubes Protect High-Power Transmitters. W. N. Parker and M. V. Hoover. *Electronics*, v. 29, Jan. 1956, p. 144-147.

Circuits detect the development of fault conditions in power tubes and trigger a gaseous-conduction device connected in shunt with the d.c. supply, extinguishing the flash-arc before serious damage results. Photographs, circuit diagrams. 9 ref.

2048 Analysis of a Differential Magnetic Amplifier With Flux Reset Control. Charles A. Belsterling. *Franklin Institute Journal*, v. 260, Dec. 1955, p. 485-505.

Experimental results verify the theoretical operation and the usefulness of the derived gain and output range equations. It is possible to make intelligent use of a simple, yet extremely versatile magnetic amplifier circuit. Photograph, diagrams, table, graphs. 5 ref.

2049 Some Aspects of Ferroelectricity. G. Shirane, F. Jona, and R. Pepinsky. *I. R. E., Proceedings*, v. 43, Dec. 1955, p. 1738-1793.

Emphasis placed on crystal and domain structures, and their contributions to the dielectric behavior of ferroelectrics and antiferroelectrics. Diagrams, graphs, photographs, tables, micrographs. 166 ref.

2050 Electric Equipment for Reversing Hot Strip Mills. C. C. Thomas. *Iron and Steel Engineer*, v. 32, Dec. 1955, p. 92-109.

Design and construction details are given for a number of mills now in use in U. S. Diagrams, tables, graphs.

2051* Auxiliary Equipment for the Capacitor-Type Transducer. A. F. Welch, E. F. Weller, E. A. Hanysz, and J. W. Bergstrom. *ISA Journal*, v. 2, Dec. 1955, p. 548-551.

Recent advances in capacitance detectors for use with the capacitor transducer, associated circuits for detecting engine knock, and equipment for indicating and recording engine pressure-time phenomena. Table, graphs, diagrams, photographs, oscillogram. 6 ref.

2052 Electrical Power for Plating. I. Motor-Generators. II. Rectifiers. III. Plating Tank Wiring. William E. Schwarz, James A. Viola, William E. Bryan, and Nathaniel Hall. *Metal Finishing (Guidebook-Directory Ed.)*, 1956, p. 54 + 14 pages. (T13 M56f)

Types of and controls for motors, generators, and rectifiers, and wiring systems. Diagrams, graphs, table.

2053* Aluminum in Heavy Current Conductors. William Deans. *Power Apparatus and Systems*, 1955, no. 21, Dec., p. 1192-1198; disc., p. 1198-1200.

Properties of both Cu and Al bus conductors, design requirements for conductors and joints in order to obtain satisfactory performance. Tables.

2054* Experiences With the Use of Aluminum in Windings for Dry-Type Power Transformers. E. W. Tipton. *Power Apparatus and Systems*, 1955, no. 21, Dec., p. 1201-1204.

Reasons for application of Al to this type of transformer; basis of design; electrical, mechanical, and thermal properties and their effect on design; comparison of Al and Cu-wound transformers; various types of joints; and cost data. Photograph, tables, graphs, diagrams.

2055 Studies of Externally Heated Hot Cathode Arcs. IV. The Low-Voltage Form of the Ball-of-Fire Mode (the Low-Voltage Arc). Edward O. Johnson. *RCA Review*, v. 16, Dec. 1955, p. 498-532.

Discharge operates with an anode potential that is small compared to the ionization potential of the gas. Likelihood that resultant behavior is similar to that in the phenomenon of striations. Diagrams, graphs, photograph, tables. 20 ref.

ELECTROCHEMISTRY AND ELECTROPROCESSES

2056* Research on the Preparation, by Fused Electrolysis, of Germanium and Some of Its Binary Alloys With the Transition Metals. **Recherches sur la préparation par électrolyse ingnée du germanium et de quelques-uns de ses alliages binaires avec les metaux de transition.** (French.) Marie-Jeanne Barbier-Andrieux. *Annales de chimie (Paris)*, v. 10, Sept.-Oct. 1955, p. 754-806.

Three new methods of preparing Ge consisting in electrolyzing Na digermanate with possible addition of NaF and Ge oxide dissolved in fused alkaline silicates or in fused Na borosilicate. Tables, graphs, photographs. 58 ref.

2057 Continuous Anodic Oxidation of Copper Wire. Dallas T. Hurd, James G. Krieble, and H. G. Pfeiffer. *Industrial and Engineering Chemistry*, v. 47, Dec. 1955, p. 2483-2491.

Black Cu oxide applied to Cu wire, by continuous electrolytic oxidation in hot alkaline solution, appears to meet all the requirements of a good barrier substrate for the higher operating temperatures of electrical apparatus. Diagrams, graphs, table, photographs. 6 ref.

2058 Alloy Plating Can Give Your Products New Appeal. F. A. Lowenheim and R. T. Gore. *Iron Age*, v. 176, Dec. 22, 1955, p. 67-70.

Plating of alloys is gaining importance because it offers unique combinations of properties and improved sales appeal of products with attractive new coatings. Photographs.

2059 Barrel Plating Setup Combines High Output With Versatility. G. W. Harding. *Iron Age*, v. 176, Dec. 29, 1955, p. 65-67.

New plating system alters thicknesses every 15 min. by an automatic device. It handles batch-load specifications up to 20,000 lb. hourly. Photographs.

2060* Some New Data on the Cryolite Baths in Aluminum Metallurgy. **Néhány újabb adat az alumíniumkohók kriolitfurdőiről.** (Hungarian.) Elemér Papp. *Magyar Kémikusok Lapja*, v. 10, no. 11, Nov. 1955, p. 352-353.

Problems of synthetic cryolite; manufacturing suggestions. Tables. 9 ref.

2061 Plating Room Layout. J. J. Martin, Jr. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 11+ 4 pages. (T13 M56f)

Basic equipment design and layout.

2062 Plating Room Floor Construction. Robert S. Mercer. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 20, 22-25. (T13 M56f)

The base floor, the impervious interlines, the surface or protective sheating, and drainage. Diagram.

2063 Corrosion Resistant Tanks and Linings. Milton Nadel. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 77 + 6 pages. (T13 M56f)

Evaluates wood, plastic, glass, ceramic, concrete, and steel for tanks, and various linings for steel tanks. Table.

2064 Heating Plating Solutions. G. B. Hogaboom, Jr. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 87-88. (T13 M56f)

Means for computing boiler horsepower needed to fill the B.T.U. requirement of a plating tank. Necessary tank coil dimensions and burner capacities are presented in tabular form. 2 ref.

2065 Cooling of Plating Solutions. Mary Rubinstein. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 90, 92-95. (T13 M56f)

Cooling methods and cooling calculations for baths. Tables.

2066 Agitation of Plating Solutions. Mary Rubinstein. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 96-101. (T13 M56f)

Discusses air and mechanical agitation, solution circulation, convection, and ultrasonics with regards to materials and constituents used.

2067 Electroplating on Magnesium Alloys. Myron B. Diggin. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 243-249. (T13 M56f)

Surface conditioning, activating pickling, Zn immersion coating, Cu striking, and standard plating constitute the basic steps required in Mg plating. 2 ref.

2068 Cyanide Cadmium Plating. R. O. Hull. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 254, 256, 258. (T13 M56f)

Solution compositions, general operations, equipment, and deposition rates. 5 ref.

2069 Chromium Plating. George Dubpernell. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 260 + 6 pages. (T13 M56f)

Discusses ornamental, industrial, high-speed, basket, barrel, and porous Cr plate. Micrographs.

2070 Acid Copper Plating. Louis Packman and A. T. Marinaro. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 272, 275-276. (T13 M56f)

The techniques that have proven successful in bright Ni plating are being applied to Cu with excellent results, but the inherent disadvantage of this type of solution is that steel and Zn parts require a strike or flash coating from a cyanide type Cu bath.

2071 Cyanide Copper Plating. Barnet D. Ostrow and Fred I. Nobel. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 276 + 6 pages. (T13 M56f)

Includes tables.

2072 Fluoborate Copper Plating. A. E. Carlson and Clifford Struyk. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 287-288. (T13 M56f)

Bath composition and formulation, operating conditions, maintenance, and control.

2073 Gold Plating. Edward A. Parker. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 290 + 8 pages. (T13 M56f)

Decorative plating, antique golds, variables in Au alloy plating, throwing power of Au solutions, and industrial Au plating, and testing of deposits. 4 ref.

2074 Indium Plating. Daniel Gray. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 302-305. (T13 M56f)

Both formulations for sulfate, fluoborate, sulfamate, and cyanide baths. 23 ref.

2075 Iron Plating. Almo D. Squitero. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 305-311. (T13 M56f)

Discusses chloride, sulfate, and fluoborate baths. 3 ref.

2076 Lead Plating. F. C. Mathers. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 311-317. (T13 M56f)

Fluosilicate, fluoborate, sulfamate, and other acid baths, and alkaline lead baths. 41 ref.

2077 Lead-Tin Alloy Plating. A. E. Carlson and Clifford Struyk. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 317-320. (T13 M56f)

Presents Pb and Sn fluoborate analyses, and bath composition, preparation, and control.

2078 Nickel Plating. Walter H. Prine. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 321-322, 324-330. (T13 M56f)

Plating solutions of a non-proprietary nature which are usually used for a specific purpose. Includes suggested corrections for plating difficulties. Graphs. 5 ref.

2079 Bright Nickel Plating. E. B. Saubestre. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 330, 332-338. (T13 M56f)

Treats plating for decorative purposes, and considers the organic bright Ni, Ni alloy, and highly buffable Ni baths, PR plating, and electropolishing. Tables. 37 ref.

2080 Black Nickel Plating. A. T. Marinaro and Louis Packman. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 338-339. (T13 M56f)

Used primarily for appearance and color, the deposit thickness is about 0.00005 in. and is therefore not durable. Discusses solution composition and operating conditions.

2081 Palladium Plating. Harold Robinson. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 340-341. (T13 M56f)

Composition of NaPd nitrite, diammino nitrite, and acid chloride baths. Greatest application is in the electronics field.

2082 Platinum Plating. Harold Robinson. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 341-342. (T13 M56f)

Describes "P" salt bath and chloroplatinic acid bath.

2083 Rhodium Plating. Harold Robinson. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 342-345. (T13 M56f)

Composition of phosphate, sulfate, and heavy deopsit baths; barrel Rh plating process. Graph.

2084 Ruthenium Plating. Harold Robinson. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 346. (T13 M56f)

Deposits can be produced to 0.0015 in. thickness. Bath formula for satisfactory deposits.

2085 Silver Plating. N. E. Promisel. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 346 + 5 pages. (T13 M56f)

Makeup and operating conditions for a strike solution and three plating solutions; effects of different factors on solution properties and operation; high speed plating baths; work treatment.

2086 Tin Plating From Acid Baths. F. C. Mathers. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 353-357. (T13 M56f)

Presents three solutions. Discusses pickling, anodes, addition agents, and sludge control. 41 ref.

2087 Tin Plating From the Fluoborate Bath. A. E. Carlson and Clifford Struyk. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 358-359. (T13 M56f)

Bath composition and operating conditions.

2088 Tin Plating From Alkaline Stannate Baths. Frederick A. Lowenheim. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 359-365. (T13 M56f)

Distinguishes between Na and K stannate baths; solution composition for still tank and barrel plating. Discusses control and maintenance, temperature, voltage, sludge, plating time, equipment, and quality control. 1 ref.

2089 Tin-Nickel Alloy Plating. Frederick A. Lowenheim. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 366-368. (T13 M56f)

Discusses deposit characteristics, solution composition, equipment, operation and control, and stripping. 3 ref.

2090 Plating Tin-Zinc Alloys. Frederick A. Lowenheim. *Metal Finishing (Guidebook–Directory Ed.),* 1956, p. 368-372. (T13 M56f)

Formulations for still tanks and automatics, and for barrels; specifications for working conditions, anodes, and current-time relationships; control and influence of variables.

2091 Acid Zinc Plating. R. O. Hull. *Metal Finishing (Guidebook–Directory Ed.),* 1956, p. 372-373. (T13 M56f)

Solution composition and maintenance, and operating conditions. Acid Zn plating provides a smooth, white, rust-resistant coating.

2092 Cyanide Zinc Plating. R. O. Hull. *Metal Finishing (Guidebook–Directory Ed.,)* 1956, p. 373-375. (T13 M56f)

Solution composition and maintenance. 1 ref.

2093 Barrel Plating Fundamentals. H. J. Struckhoff. *Metal Finishing (Guidebook–Directory Ed.),* 1956, p. 376, 378, 380. (T13 M56f)

Discusses equipment, material, contacts, load, area, speeds, and current.

2094 Filtration of Plating Solutions. Harold W. Faint. *Metal Finishing (Guidebook–Directory Ed.),* 1956, p. 387 + 4 pages. (T13 M56f)

Discusses filter aids and trouble shooting pointers for suction lines, pumps, and valves.

2095 Rinsing Techniques. Joseph B. Kushner. *Metal Finishing (Guidebook–Directory Ed.),* 1956, p. 399-404. (T13 M56f)

Means for calculating amount of rinse water necessary for multiple tank rinsing with and without cascade feeding. Discusses wetting agents, size and design of rinse tanks, and automatic rinse control. Diagram, graphs. 8 ref.

2096 Stripping Metallic Coatings. Nathaniel Hall, G. B. Hogaboom, Jr., and J. B. Mohler. *Metal Finishing (Guidebook–Directory Ed.),* 1956, p. 426-528, 430-434. (T13 M56f)

Formulas for stripping brass, Cd, Cu, Cr, Au, bronze, Pb, Ni, Rh, Ag, Sn, Sn-Zn alloy, Zn, and oxide and phosphate coatings from metals.

2097 Anodizing Aluminum. Nathaniel Hall. *Metal Finishing (Guidebook–Directory Ed.),* 1956, p. 435-438. (T13 M56f)

Outlines chromic acid, sulfuric acid, and hard anodizing processes, and cites the conditions under which each is applicable. Graph.

2098 Coloring Anodized Aluminum. Frank P. Stiller. *Metal Finishing (Guidebook–Directory Ed.),* 1956, p. 439-440, 442-443. (T13 M56f)

Discusses equipment, rinsing, sealing, shade, dyeing conditions, surface preparation, multicolor anodizing, and lightfastness of the dyed coating.

2099 Electropolishing Charles L. Faust. *Metal Finishing (Guidebook–Directory Ed.),* 1956, p. 415-424. (T13 M56f)

Advantages, limitations, costs, general procedures, commercial methods, and equipment for electropolishing. Diagram, tables. 8 ref.

2100 Surface Treatments for Magnesium. Myron B. Diggin. *Metal Finishing (Guidebook–Directory Ed.),* 1956, p. 443-463. (T13 M56f)

Cleaning, pickling, and mechanical finishing; paint base, black, electrochemical, and other treatments; assembly protection, organic coatings, and specifications. Tables. 1 ref.

2101 Testing Porosity, Adhesion and Hardness. Walter H. Prine. *Metal Finishing (Guidebook–Directory Ed.),* 1956, p. 482-485. (T13 M56f)

Production testing procedures presented will permit a reasonable degree of control of deposits. 7 ref.

2102 Thickness Testing of Electrodeposits. Everett A. Hodges. *Metal Finishing (Guidebook–Directory Ed.),* 1956, p. 486, 488-495. (T13 M56f)

Outlines microscopic, weight-area, hydrochloric acid spot-test, micrometer, magnetic, anodic solution, dropping, and jet test methods. Graphs. 13 ref.

2103 Control of Plating Baths With Plating Cells. R. O. Hull. *Metal Finishing (Guidebook–Directory Ed.),* 1956, p. 500-503. (T13 M56f)

Testing procedure. Observation and variables controllable by the Hull Cell are presented. Diagrams, graphs.

2104 Tin Alloy Coatings. S. C. Britton. *Metal Industry,* v. 87, Dec. 16, 1955, p. 510-511.

A discussion of the results of investigations into possible alternatives to decorative Ni-Cr finishes. Photographs. 5 ref.

2105* Protective Coatings for Steels Used Up to 1000 F. *Metal-Working,* v. 12, Jan. 1956, p. 14-16.

Treatment employed in selecting the protective coating for a low-alloy steel part; applications and limitations of various coatings. Table, photographs.

2106 Diffused Nickel Cadmium as a Corrosion Preventive Plate for Jet Engine Parts. Ralph W. Moeller and William A. Snell. *Plating,* v. 42, Dec. 1955, p. 1537-1540.

Engineering application, on a production scale, of 0.0003-inch Ni plus 0.0001-inch Cd, diffused at 630 F, for low alloy steel parts for engine parts operating at temperatures up to 1000 F. Micrographs, photographs.

2107 Study of Copper Anodes in Acid and Cyanide Plating Baths. William H. Safranek and Charles L. Faust. *Plating,* v. 42, Dec. 1955, p. 1541-1546.

Utilizing high-purity cast anodes overcomes the disadvantage of electrolytic Cu with respect to fastening hooks. The cast anodes dissolve uniformly and create less scrap, and are supplied in longer lengths. Particle roughness is reduced, and as a result diaphragms have been eliminated in some installations. Tables, graphs.

2108* Electropolishing Methods for Silver and Gold. J. M. Leslie. *Product Finishing,* v. 8, Dec. 1955, p. 69-75.

A review of the chief processes that have been developed. Graphs, table. 16 ref.

2109* Hard Chromium Plating of Tool Steels. A. W. F. Comley and T. E. Such. *Product Finishing,* v. 8, Dec. 1955, p. 76-80, 104.

A discussion of pre-treatment methods and plating baths used. Graph, photograph, tables.

2110 Electrodeposition. A. E. Davies. Paper from REPORTS ON THE PROGRESS OF APPLIED CHEMISTRY. v. XXXIX. p. 117-128. 1954. Society of Chemical Industry, London. (TP1 So13r)

Results on 13 specific metals and on porous metals, metal powders, and alloys. General theory. 160 ref.

2111 Some Successful Applications of Electrolytic Polishing in Industry. R. Mondon. *Sheet Metal Industries,* v. 32, no. 344, Dec. 1955, p. 923-931, 934.

Properties of electrolytically polished metal surfaces; applications of the process to various production problems. Micrographs, photographs, diagrams, graphs. 12 ref.

2112 Tin Alloy Coatings as Alternatives to Nickel-Chromium. S. C. Britton. *Tin and Its Uses,* 1955, no. 33, p. 10-12.

Reports some of the results obtained in extensive exposure trials carried out by Tin Research Institute. Micrographs.

2113* Criterion on Evenness of Metal Distribution on the Cathode. **O kriterii ravnomernosti raspredeleniia metalla na katode.** (Russian.) L. I. Kadaner. *Zhurnal prikladnoi khimii,* v. 28, no. 11, Nov. 1955, p. 1174-1178.

Effect of interelectrode distance on current density; polarizability of cathode. Diagram. 9 ref.

2114* Ferrocyanide Electrolyte for Silvering. **Zhelezistosinerodistyi elektrolit dlia serebreniia.** (Russian.) V. I. Semeriuk. *Zhurnal prikladnoi khimii,* v. 28, no. 11, Nov. 1955, p. 1240-1242.

Silver deposits are dense, finely crystalline, easily polished, and cling well to base metal of Cu and brass. This electrolyte also permits thick depositions of 30μ and more without intermediate roughing. 3 ref.

See also: **1920** (plating solutions analysis); **2473** (anodized Al coatings); **2550** (electropolishing of Zn); **2736** (plating on plastics); **2753** (treatment of plating solutions).

ELECTRONICS

2115* Measurement of Dielectric Constants of Liquids in the Decimeter Wave Range. **Zur Messung der Dielektrizitätskonstaten von Flüssigkeiten im Dezimeterwellenbereich.** (German.) Theobald Jäkel. *Annalen der Physik*, v. 17, no. 1, 1955, p. 42-54.

Theory of the new method; description of apparatus; test date. Tables, graphs, diagrams. 10 ref.

2116* Distribution of the Current Along a Cylindrical Transmission Antenna. **La répartition du courant le long d'une antenne cylindrique a l'émission.** (French.) Paul Poincelot. *Annales des télécommunications*, v. 10, no. 9, Sept. 1955, p. 186-194.

Thorough theoretical analysis of the problem based on the method of Lorentz using Maxwell equations. This method is suggested by the study of transistory conditions where the time factor is replaced by the space. Diagrams. (To be continued.)

2117* The Numerical Calculation of Transitory Responses and Frequency Responses by Electrical Computing Machines. **Le calcul numérique des réponses transitoires et des réponses en fréquence au moyen de machines électro-comptables.** (French.) L. Doffe and L. Rosenthal. *DOCAERO; revue documentaire de la technique aéronautique mondiale*, 1955, no. 35, Oct. 1955, p. 41-50.

Describes principle and method, with examples of calculations. Graphs. 6 ref.

2118 Magnetoresistance. New Tool for Electrical Control Circuits. R. K. Willardson and A. C. Beer. *Electrical Manufacturing*, v. 57, Jan. 1956, p. 79-84.

Operating principles of the magnetoresistive element and physical characteristics of indium antimonide are described and several possible applications are suggested. Diagrams, graphs, table. 7 ref.

2119 Running-Voltage/Current Characteristics of Some Glow-Discharge Tubes. F. A. Benson and G. Mayo. *Electronic Engineering*, v. 27, Dec. 1955, p. 540-542.

Typical running-voltage/current characteristics of nine types of recently developed or newly designed glow-discharge tubes are presented and discussed. It is concluded that the kind of gas filling is a most important factor in determining the shape of such characteristics and hence the tube behavior. Some information is also given about running-voltage drifts which occur after switching on a tube and after charging the tube current. Graphs. 9 ref.

2120 Transistors Up Reliability of Broadcast Remotes. Paul G. Wulfsberg. *Electronics*, v. 29, Jan. 1956, p. 122-125.

Design considerations and details of an amplifier which utilizes new transistors available in production quantities. Photographs, graphs, circuit diagrams. 1 ref.

2121 Fuel Cut-Off for Guided Missiles. Gerald L. Zomber and Donald MacMillan. *Electronics*, v. 29, Jan. 1956, p. 126-127.

Frequency selectivity and stability of operating potentials were main factors in the development of an audio-frequency operated relay. Subminiturization techniques were used to develop unit. Photographs, circuit diagram.

2122 Simplified Analog Computer. Victor B. Corey. *Electronics*, v. 29, Jan. 1956, p. 128-131.

Normal problems in differential equations are solved by a compact computer which sacrifices extreme accuracy, but is versatile enough to handle the most complex problems. Photograph, circuit diagrams, graph. 2 ref.

2123 Analog-to-Digital Data Converter. Sherman Rigby. *Electronics*, v. 29, Jan. 1956, p. 152-155.

A variable-frequency pulse oscillator possessing a range of over four decades with an accuracy of 0.1%. Circuit diagrams, graph, photograph, diagrams. 4 ref.

2124 Transistor Characteristics for Circuit Designers. Seymour Schwartz. *Electronics*, v. 29, Jan. 1956, p. 161-172, 174.

Tabular information on physical properties, electrical ratings, small-signal L.F. parameters, and average characteristics for grounded-base, grounded-emitter, grounded-collector, and switching circuits for 218 types of transistors. Tables, circuit diagrams, graphs.

2125 The Semiconductivity of Organic Substances. II. D. D. Eley and G. D. Parfitt. *Faraday Society, Transactions*, v. 51, Nov. 1955, p. 1529-1539.

Discusses the a.c. method, impurifies and the energy gap, theory of the energy gap, and the pre-exponential factor. Graphs, diagrams, table. 26 ref.

2126 The Electronic Energy Band Structure of Silicon and Germanium. Frank Herman. *I. R. E., Proceedings*, v. 43, Dec. 1955, p. 1703-1732.

Introduction to the quantum theory of crystals, covering the theory energy of bands in a perfect crystal, structure, and relationship between some of the electrical and optical properties. Diagrams, graphs. 71 ref.

2127 History of Semiconductor Research. G. L. Pearson and W. H. Brattain. *I. R. E., Proceedings*, v. 43, Dec. 1955, p. 1794-1806.

Special consideration given to the inception of new ideas and the resolution of older discrepancies. Tables. 118 ref.

2128 Photoconduction in Germanium and Silicon. M. L. Schultz and G. A. Morton. *I. R. E., Proceedings*, v. 43, Dec. 1955, p. 1819-1828.

The intrinsic response of the crystals extends through the entire visible spectrum into the near infra-red, but doped, with appropriate foreign atoms and operated at low temperatures, they are effective impurity photoconductors with response extending into the far infra-red. Diagrams, graphs, tables. 58 ref.

2129 Photoeffects in Intermetallic Compounds. H. P. R. Frederikse and R. F. Blunt. *I. R. E., Proceedings*, v. 43, Dec. 1955, p. 1828-1835.

Classification of the compounds according to crystal structure and position of component elements in the periodic system. Surveys the properties of compounds with zincblende and fluorite lattice. Tables, graphs, diagram. 40 ref.

2130 Photoconductivity of the Sulfide, Selenide, and Telluride of Zinc or Cadmium. R. H. Bube. *I. R. E., Proceedings*, v. 43, Dec. 1955, p. 1836-1850.

Preparation of photoconductors as evaporated, powder, or sintered layers, and as single crystals. Investigation of several photoconductivity phenomena clarifying the future of the photon and electron processes in the photoconductors. Photograph, diagrams, tables, graphs. 118 ref.

2131 Performance of Photoconductors. Albert Rose. *I. R. E., Proceedings*, v. 43, Dec. 1955, p. 1850-1869.

A phenomenological analysis of the process whereby the conductivity of a material is increased by exposure to radiation. Diagrams, graph. 54 ref.

2132 Lead Salt Photoconductors. T. S. Moss. *I. R. E., Proceedings*, v. 43, Dec. 1955, p. 1869-1881.

Manufacture of cells and processing photosensitive layers; response time, sensitivity, and spectral distribution of sensitivity of the final detectors; factors determining the maximum attainable sensitivity; fundamental semiconducting properties of lead sulfide, telluride, and selenide; theory of photoeffects in layers. Diagrams, graphs, tables. 130 ref.

2133 Electroluminescence and Related Topics. G. Destriau and H. F. Ivey. *I. R. E., Proceedings*, v. 43, Dec. 1955, p. 1911-1940.

Observed phenomena, theoretical explanations, and applications of intrinsic and carrier-injection electroluminescence and of electrophotoluminescence. Table, diagrams, graphs, photographs. 162 ref.

2134 Design Principles of Junction Transistor Audio Amplifiers. R. L. Trent. *Institute of Radio Engineers, Transactions on Audio*, v. Au-3, Sept.-Oct. 1955, p. 143-161 (In6.6au)

Effects of applying feedback to the amplifier configurations are discussed and various methods for minimizing drifts of the quiescent point of operation of transistor amplifier stages considered. Signal-to-noise ratios, important in the design of high quality amplifiers, are developed in terms of device noise figures. Diagrams, graphs. 22 ref.

2135 Analysis of Nonlinear Circuits Using Impedance Concepts. J. S. Thomsen and S. P. Schlesinger. *Institute of Radio Engineers, Transactions on Circuit Theory*, v. CT-2, Sept. 1955, p. 271-278. (TK1 In6.6c)

Includes circuit diagrams, graphs, diagrams. 11 ref.

2136 Capacitance Measurements on Alloyed Induim-Germanium Junction Diodes. D. R. Muss. *Journal of Applied Physics*, v. 26, Dec. 1955, p. 1514-1517.

Donor densities in the base material of fused junction diodes are used to calculate majority carrier mobilities. Diagram, graphs. 9 ref.

2137* The Spontaneous Hall Effect In Ferromagnetics. I. (English.) J. Smit. *Physica*, v. 21, no. 11, Nov. 1955, p. 877-887.

Existing theories on the origin of the effect are invalid, and it is shown that the explanation has to be based on the anisotropic scattering, caused by spinorbit interaction, of the conducting electrons against the imperfections of the lattice. Diagram, graphs, table. 15 ref.

2138 Minority Carrier Extraction in Germanium. Ralph Bray. *Physical Review*, v. 100, ser. 2, Nov. 15, 1955, p. 1047-1055.

Concentration of minority carriers in a sample can be effectively decreased below its equilibrium value by an extraction process in which the minority carriers in the sample are swept out by an electric field in a time $<<$ lifetime, while the minority carrier flow into the sample at the entry contact, is suppressed. Diagrams, graphs, table. 16 ref.

2139 Electrical Properties of Near-Degenerate Boron-Doped Silicon. R. O. Carlson. *Physical Review*, v. 100, ser. 2, Nov. 15, 1955, p. 1075-1078.

Measurements of extrinsic resistivity and Hall effect have been carried out for a group of Si single crystals containing a wide range of B concentration, with particular stress on samples in the near-degenerate range, 10^{15} to 10^{19} B atoms per cm^3. Graphs, table. 10 ref.

2140 Recombination Processes in Tellurium. David Redfield. *Physical Review*, v. 100, ser. 2, Nov. 15, 1955, p. 1094-1100.

Recombination processes in Te investigated photoconductivity techniques. Studies were made on single crystals having acceptor densities of about 10^{16} per cm^3. By using pulsed illumination, the decay time constant of the photocurrent was found to be 20μ sec., in fairly good agreement with results obtained previously from steady-state photocurrent sensitivity. Diagrams. 18 ref.

2141 Conductivity, Hall Effect, and Magnetoresistance in *n*-Type Germanium, and Their Dependence on Pressure. George B. Benedek, William Paul, and Harvey Brooks. *Physical Review*, v. 100, ser. 2, Nov. 15, 1955, p. 1129-1139.

Examination of the galvanomagnetic properties using the application of high hydrostatic pressure as a means of varying the energy-band structure. Diagrams, tables. 22 ref.

2142 Improvement in Color Kinescopes Through Optical Analogy. D. W. Epstein, P. Kaus, and D. D. VanOrmer. *RCA Review*, v. 16, Dec. 1955, p. 491-497.

Causes of misregister in detail; indicates some of the means in use to minimize the effects, and describes a new optical approach which eliminates the misregister almost completely. Diagrams, graph. 2 ref.

2143 Transistorized Sync Separator Circuits for Television Receivers. Hunter C. Goodrich. *RCA Review*, v. 16, Dec. 1955, p. 533-550.

Presents circuits which appear to meet commercial requirements for operation under both good and adverse conditions. Circuit diagrams, graphs, photographs. 2 ref.

2144 Interception Noise in Electron Beams at Microwave Frequencies. W. R. Beam. *RCA Review*, v. 16, Dec. 1955, p. 551-579.

A theory is derived for interception-produced partition noise current and velocity in an electron beam of finite or infinite cross section. Graphs. 14 ref.

2145 Transient Response of Detectors in Symmetric and Asymmetric Sideband Systems. T. Murakami and R. W. Sonnenfeldt. *RCA Review*, v. 16, Dec. 1955, p. 580-611.

It is shown that the limitations of the envelope detector are eliminated when a synchronous detector is used. Graphs, diagrams, micrographs. 16 ref.

2146 Experimental High-Transconductance Gun for Kinescopes. F. H. Nicoll *RCA Review*, v. 16, Dec. 1955, p. 612-617.

Use of electroformed fine mesh on the control grid aperture of an experimental electron gun gives an order of magnitude reduction in required video drive. Focus and current characteristics are acceptable for many applications. Micrographs, photograph, diagram, graph.

2147 An accurate Electronic Multiplier. Sidney Sternberg. *RCA Review*, v. 16, Dec. 1955, p. 618-634.

Development of a high-accuracy multiplier which uses a time-division principle. Diagrams, graph, photographs. 3 ref.

2148 A New Low-Power Single-Sideband Communication System. E. A. Laport and K. L. Neumann. *RCA Review*, v. 16, Dec. 1955, p. 635-647.

Usable for telephony, manual telegraphy, and teleprinter operation over short and medium distances. Primarily intended for suppressed-carrier operation. Diagrams, photographs. 1 ref.

2149 A Locked-Oscillator Quadrature-Grid FM Sound Detector. Jack Avins and Thomas Brady. *RCA Review*, v. 16, Dec. 1955, p. 648-655.

Describes a quadrature-grid F.M. detector which employs a pentode tube having a sharp-cutoff suppressor characteristic. The circuit is relatively simple and capable of performance comparable to that of a ratio-detector audio-amplifier combination. Table, diagrams, oscillograms.

2150* The Behavior of Ferrites at Microwave Frequencies. Bobby J. Duncan and Leonard Swern. *Sperry Engineering Review*, v. 8, Nov.-Dec. 1955, p. 23-28.

Discussion of theoretical results of a plane wave propagating in an infinite ferromagnetic medium, and an application to ferrites of finite dimensions. Graphs, diagrams. 6 ref.

Books and Miscellaneous Publications

2151 Fundamentals of Television Engineering. Glenn M. Glasford. McGraw-Hill Electrical and Electronic Engineering Series. 642 p. 1955. McGraw-Hill, New York. (TK6630 G46f)

Fundamental principles involved in the electronic transmission and reproduction of visual information and an analysis of techniques and methods.

2152 Practical Electroacoustics. Michael Rettinger. 271 p. 1955. Chemical Publishing Co., New York. (TK5981 R31p)

Description and analysis of the essential units of audiocommunication equipment.

2153 High Vacuum Electron Tubes. **Hochvakuum-Elektronenröhren. v. I.** Physical Fundamentals. **Physikalische Grundlagen.** (German.) Horst Rothe and Werner Kleen. 297 p. 1955. Akademische Verlagsgesellschaft M.B.H., Frankfurt. (TK7872.V3 R74h)

Emission of electrons without initial velocity and with Maxwell velocity distribution; space-charge limited cathode currents; space-charge free potential fields; secondary emission of solids.

See also: **2217** (electronic business machines).

ENGINEERING ECONOMICS

2154 Metalworking Facts for 1956. *American Machinist (1956 Production Planbook Issue)*, v. 99, Mid-Nov. 1955, p. 1A-16A. (TJ1 Am35mb)

Outlook for the yr., based on facts and predictions, regarding expenditures, production, exports, equipment, wages and prices, and employment. Graphs, tables.

2155 The Venture Worth Method for Economic Balances. John Happel. *Chemical Engineering Progress*, v. 51, Dec. 1955, p. 533-539.

Presents a plan for applying certain general principles in determining a satisfactory financial return on a chemical engineering investment. 13 ref.

2156 Forecast for '56. *Chemical Week*, v. 77, Dec. 31, 1955, p. 27-48.

Outlook for the year with respect to the chemical industry. Items considered are: expansions and new facilities; business and industry; markets; research; production; specialties, and distribution. Graphs, photographs.

2157 Fresh Water for the Future. E. R. Gilliland. *Industrial and Engineering Chemistry*, v. 47, Dec. 1955, p. 2410-2422.

The processes that should be the most attractive are multieffect evaporation, vapor-compression distillation, freezing, and the electrical-membrane systems. Solar distillation and ion exchange will be useful for some special small scale units. Table, photographs, graphs, diagrams. 20 ref.

2158* Target: Tops in Containers. E. A. Ferrell. *Modern Metals*, v. 11, Dec. 1955, p. 79-80, 82.

Rapid increase in the number of uses for Al foil has resulted in Alcoa and Ekco to pool their know-how and resources and bid for foil's biggest market. Photographs.

2159 Resins Up a Billion Pounds. *Modern Plastics*, v. 33, Jan. 1956, p. 75 + 45 pages.

Total production of synthetic resins and cellulosics from 1934 to 1955; sales of synthetic resins and cellulosics for 1955; and the potentials for phenolics, nylon, urea and melamine, acrylics, vinyl chloride, polyethylene, cellulosics, and polystyrene during 1956. Graph, photograph, tables.

2160 Engineering Progress in 1955. *Modern Plastics*, v. 33, Jan. 1956, p. 115 + 14 pages.

A review of articles published during 1955. Includes the following: molds and molding, studies of machinery, handling polyethylene, reinforced plastics, quality control, and decorating. Diagrams, graphs, photographs, tables.

2161 World-Wide Oil Report. Paul Swain and Ray G. Gibson. *Oil and Gas Journal*, v. 54, Dec. 26, 1955, p. 141-198.

Discusses reserves, production, refining, present status of oil industry, and proposed expansion program in 46 countries. Tables, maps.

2162 What Metalworking Management Expects in 1956. *Steel (Metalworking Yearbook Issue)*, v. 138, Jan. 2, 1956, p. 105-112.

Survey of managers' expectations with regard to employment, selling prices, sales volume, unit cost of manufacturing, capacity, sales and distribution costs, and research for 1956. Tables, graphs.

2163 1956 Metalworking Facts and Figures. *Steel (Metalworking Yearbook Issue)*, v. 138, Jan. 2, 1956, p. 145-192.

Figures on production, sales, labor, prices, and earnings. Diagrams, graphs, tables.

2164* China—Industrial Power of the Future. **Chiny—przemysłowe mocarstwo przyszłości.** (Polish.) Władysław Gryksztas. *Wiadomości hutnicze*, v. 11, no. 10, Oct. 1955, p. 321-326.

For the sixth anniversary of Red China's regime, author reviews their metallurgical progress, including steel work at Anshan southwest of Mukden. Photographs.

Books and Miscellaneous Publications

2165 Business Year Book. B. M. Hamilton, editor. 31st Ed. 160 p. 1955. Maclean-Hunter Publishing Co., Montreal. (T12 C2b)

Market survey of the latest statistics of Canada's industries and businesses; special reviews of the major economic and business indicators. Photograph, table.

2166* Statistics of Oil and Gas Development and Production. v. IX. 542 p. 1955. American Institute of Mining and Metallurgical Engineers, New York. (TN860 A35s)

Comprehensive coverage of U. S. and foreign production statistics for 1954.

2167* Boron. Joseph C. Arundale and Flora B. Mentch. 10 p. Preprint from Bureau of Mines Minerals Yearbook 1953. Available from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. (TN23 Un3mi)

Trade stastistics, prices, uses, and technology. Tables. 29 ref.

2168* Calcium. Joseph C. Arundale and Flora B. Mentch. 4 p. Preprint from Bureau of Mines Minerals Yearbook 1953. Available from Superintendent of Documents U. S. Government Printing Office, Washington, D. C. (TN23 Un3mi)

Trade statistics, prices, uses, and technology. Tables. 8 ref.

2169* Chromium. Charles Katlin and Hilda V. Heidrich. 16 p. Preprint from Bureau of Mines Minerals Yearbook 1953. Available from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. (TN23 Un3mi)

Production, consumption, uses, stocks, prices, trade, and technology. Tables. 19 ref.

2170* Tungstein. Robert W. Geehan and Mary J. Burke. 13 p. Preprint from Bureau of Mines Minerals Yearbook 1953. Available from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. (TN23 Un3mi)

Production, consumption, uses, prices, stocks, trade statistics, and technology. Tables. 24 ref.

2171* Uranium, Radium, and Thorium. John E. Crawford. 42 p. Preprint from Bureau of Mines Minerals Yearbook 1953. Available from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. (TN23 Un3mi)

Trade statistics, prices, uses, production, and consumption. Maps, tables. 82 ref.

FLUID MECHANICS

2172 The Formation of Bubbles at Simple Orifices. R. R. Hughes, A. E. Handlos, H. D. Evans, and R. L. Maycock. *Chemical Engineering Progress*, v. 51, Dec. 1955, p. 557-563.

Report contains experimental and theoretical data with conclusions concerning bubble formation at simple orifices at rates which give uniform bubble size. Table, graphs. 16 ref.

2173* Contribution to the Physical Study of Jets. **Contribution à l'étude physique des jets.** (French.) Roger Curtet. *Comptes rendus*, v. 241, no. 21, Nov. 21, 1955, p. 1447-1450.

Comparison of an approximate theory of jets in a confined space with some experimental results obtained in the case of a plane symmetrical jet. Graphs. 5 ref.

2174* Oscillating Movement With Viscosity and Inertia. **Mouvement oscillatoire avec viscosité et inertie.** (French.) Claire Clarion. *Publications scientifiques et techniques du ministère de l'air*, 1955, no. 303, 76 p.

Includes tables, photographs, diagrams. 23 ref.

2175* Measuring the Rate of Gas Flow by a Cylindrical Probe. **Měření rychlosti proudění válcovou sondou.** (Czech.) F. Slepička and J. Ambrož. *Strojírenství*, v. 5, no. 10, Oct. 1955, p. 786-789.

Principles of measurement by Pitot tubes. Conditions for exact measurements. Distribution and calibration of probes. Direct and indirect measurements. Diagrams, graphs. 5 ref.

2176 Laminar Separation Over a Transpiration-Cooled Surface in Compressible Flow. Morris Morduchow. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3559, Dec. 1955, 32 p. (TL570 Un3t)

Theoretical analysis made separation in compressible flow over a transpiration-cooled surface maintained at a uniform wall temperature. Simple method developed for calculating separation point over such a surface for a given adverse pressure gradient, Mach number, wall temperature, and uniform coolant temperature. Graphs. 12 ref.

2177* Air Resistance of Rotating Discs. **Luftwiderstand von rotierenden Kreisscheiben.** (German.) W. Herchenbach. *Zeitschrift für Naturforschung*, v. 10a, nos. 9-10, Sept.-Oct. 1955, p. 741-744.

Method of air resistance calculation of high voltage generator rotating discs. Graphs. 6 ref.

See also: **1828** (transonic flow); **1970** (thermal properties of gases).

FOOD TECHNOLOGY

2178* Combined Effects of Heat and Radiation in Food Sterilization. Lloyd L. Kempe. *Applied Microbiology*, v. 3, Nov. 1955, p. 346-352.

Effect of preliminary irradiation on the heat resistance of *C. botulinum* spores, as well as the subsequent irradiation resistance of these spores after heat shocking. Graphs, tables. 3 ref.

2179 Termination Report. I. Food Irradiation and Associated Studies. *Columbia University (U. S. Atomic Energy Commission)*, NYO-3320, Sept. 1954, 47 p. (UF767 U3ny)

Contains five papers dealing with: effect of irradiated diet on rats; oxidative deterioration in irradiated milk; effect of γ-radiation on fats; and γ-ray oxidation of ascorbic acid and ferrous ion. Graphs, tables. 41 ref.

2180 Sorbic Acid as a Fungistatic Agent for Foods. IX. Physico-Chemical Considerations in Using Sorbic Acid to Protect Foods. Chester M. Gooding, Daniel Melnick, Robert L. Lawrence, and Frederick H. Luckmann. *Food Research*, v. 20, Nov.-Dec. 1955, p. 639-648.

Investigation covered purity, solubility, phase distribution studies, and sublimation. Graphs, tables. 15 ref.

2181* Water Absorption During Reconstitution of Dehydrated Fruits and Vegetables. Jean I. Simpson, Irene C. L. Chang, Evelyn C. Appel, and Marion C. Bollman. *Food Technology*, v. 9, Dec. 1955, p. 608-612.

Effects of two variables were noted on rate and amount of water absorbed. Graphs, table. 7 ref.

2182* An Evaluation of Radiation Sources as a Means for Processing Foods. Belmont S. Evans, Jr. *Food Technology*, v. 9, Dec. 1955, p. 615-620.

Electrons and γ-rays are compared and a discussion of electron accelerating machines is given. Photographs.

See also: **2030** (canning soft drinks).

FUELS AND COMBUSTION

2183 Burning Velocities of Hydrogen-Air Flames. Herman Burwasser and Robert N. Pease. *American Chemical Society, Journal*, v. 77, Nov. 20, 1955, p. 5806-5808.

Measured by the bunsen burner method. Neither the diffusion theory nor the thermal theory explains the results. Graphs, table. 15 ref.

2184* Differential Thermal Analysis and Its Applications to Fuel Science and Technology. J. B. Nelson. *British Coal Utilisation Research Association, Monthly Bulletin*, v. 19, Sept.-Oct. 1955, p. 502-531 + 1 plate.

Covers history, apparatus and technique, theoretical interpretation of curves and applications to coal and carbonaceous materials, quartz, carbonate minerals, and miscellaneous substances. Tables, graphs, photograph, diagrams. 240 ref.

2185 The Changing Face of the Gas Industry. Arthur Marsden. *Chemical & Industry*, 1955, no. 52, Dec. 24, p. 1678-1732.

A general survey covering the progress of the gas industry from early 19th century to present time with a reasonable presentation of future possibilities. Diagrams, graphs, photographs, tables. 119 ref.

2186* Cold Flames of Pentane and Oxygen Mixtures. **Sur les flammes froides des mélanges de pentane et d'oxygène.** (French.) Michel Lucquin, Roger Ben-Aim, and Paul Laffitte. *Comptes rendus*, v. 241, no. 15, Oct. 10, 1955, p. 949-951.

Study of the region of cold flames of mixtures of n-C_5-H_{12} and O_2 as a function of pressure and concentration for different temperatures. Description of phenomenon at 350 C. Graph. 4 ref.

2187* Variation of Hydrogen Peroxide Concentration in Products of Combustion of Propane or Methane Mixtures With Air at Low Pressures. **Sur les variations de la concentration en peroxyde d'hydrogène dans les produits de combustion de mélanges de propane ou de méthane avec l'air aux basses pressions.** (French.) Nicole P. Prot, Ralph Delbourgo, and Paul Laffitte. *Comptes rendus*, v. 241, no. 19, Nov. 7, 1955, p. 1306-1308.

Includes graph, diagram. 3 ref.

2188 The Internal Structure of Flame Reaction Zones. G. Dixon-Lewis. *Gas Council, Research Communication* GC29, Nov. 1955, 30 p. (TP700 G21.2r)

Discusses internal structure of the primary reaction zone, dealing particularly with a flame front in which the properties depend only on the perpendicular distance from an initial plane parallel with and fixed with respect to the front. Graphs, photograph. 35 ref.

2189 Measuring By-Product Yield of Coke Ovens. F. R. Pullen. *Instruments and Automation*, v. 28, Dec. 1955, p. 2123-2125.

Measurement of foul gas from coke-oven batteries is of primary interest in determining their operating efficiency where oven design, construction, operating and rebuilding are concerned. Photographs, tables, diagram, graph.

2190 Effect of Changes in Gas Composition on the Utilization of Fuel Gases. E. X. Schmidt. *Iron and Steel Engineer*, v. 32, Dec. 1955, p. 110-118; disc., p. 118-119.

Gives a number of curves which can be used to determine the suitability of substituting one type of fuel gas for another. Information is valuable in selection of burner adjustments. Diagrams, graphs.

2191 Automatic Steam Generation With Steel Plant By-Product Fuels. John A. Kotsch and Herbert W. Peth. *Iron and Steel Engineer*, v. 32, Dec. 1955, p. 133-134, 136.

New boiler house is technically unique for number and variety of controls and interlocks. Coke-oven-gas-fired boilers automatically integrate with and supplement coke-breeze-fired ok boiler house. Diagram, photograph.

2192* Viscosity of Lignite Ash. **Viskosität von Braunkohlenslacke.** (German.) J. Endell. *Silicates industriels*, v. 20, no. 11, Nov. 1955, p. 405-409.

Classification of lignite ashes according to their chemical composition and physical characteristics. Determination of viscosity by the presence of impurities. Graphs, diagram.

GEOLOGY AND MINERALOGY

2193 The Crystallography of "Coesite". Lewis S. Ramsdell. *American Mineralogist*, v. 40, Nov.-Dec. 1955, p. 975-982.

X-ray data, morphology, twinning, and unit cell contents. Tables, diagrams. 2 ref.

2194 The Pectolite-Schizolite-Serandite Series. Waldemar T. Schaller. *American Mineralogist*, v. 40, Nov.-Dec. 1955, p. 1022-1031.

Indicates minerals to be isostructural and of a continuous series. Pectolite are dominantly Ca; schizolites designated as manganoan pectolites; serandite is manganese pectolite. Micrographs, tables, graph. 12 ref.

2195 Two Chlorites: Gonyerite and Melanolite. Clifford Frondel. *American Mineralogist*, v. 40, Nov.-Dec. 1955, p. 1090-1094.

Gonyerite is apparently orthorhombic pseudohexagonal, optically negative, and has deep brown color; melanolite is optically negative and has an olive green color. Data are given on X-ray patterns and optics at 500 C. Tables. 8 ref.

2196 The Endellite-Halloysite Nomenclature. George T. Faust. *American Mineralogist*, v. 40, Nov.-Dec. 1955, p. 1110-1118.

Justification for the continued use of the names halloysite and endellite is given. 23 ref.

2197 Polarization in Thorium Oxide Crystals. W. E. Danforth and J. H. Bodine. *Franklin Institute, Journal*, v. 260, Dec. 1955, p. 467-483.

Concerned with conductivity phenomena in the low O state which exists in high temperature and high vacuum operation. Diagrams, graphs, oscillogram. 8 ref.

2198* Stereotemplet Triangulation. Marvin B. Scher. *Photogrammetric Engineering*, v. 21, Dec. 1955, p. 655-664.

Method permits the achievement of scale solutions by area and is not restricted to solutions of individual flight strips. The preparation of stereotemplets, options in their design and the techniques of their assembly discussed. Advantages over the conventional slotted templet are stated. Diagrams.

GEOPHYSICS

2199 Hydromagnetism. I. A Review. Walter M. Elsasser. *American Journal of Physics*, v. 23, Dec. 1955, p. 590-609.

Deals with basic dynamical notions, hydromagnetic waves, turbulence and instability, and dynamo models. Diagrams. 52 ref. (To be continued.)

Books and Miscellaneous Publications

2200 Snow Crystals. Ukichiro Nakaya. 510 p. 1954. Harvard University Press, Cambridge, Mass. (QC929 N14s)

General classification, frequency of occurrence, and physical properties or natural snow crystals; artificial production and a comparison of artificial and natural crystals.

2201 Meteorology and Atomic Energy. 169 p. 1955. U. S. Atomic Energy Commission. Available from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. (TD887 Un3.8m)

Methods for applying meteorology to air-pollution problems in the atomic industry. Suggestions for collecting, analyzing, and using meteorological data.

GRAPHIC ARTS

2202* An Automatic Exposure-Storage Vault for Gamma-Ray Sources. D. P. Jones. *Photographic Engineering*, v. 6, no. 3, 1955, p. 167-172.

Construction, operation, and outstanding features of a device developed for use in quality control of industrial radiographic film. Diagrams, photographs.

2203* Reversal Development of Continuous-Tone Xerographic Images. R. E. Rayford and W. E. Bixby. *Photographic Engineering*, v. 6, no. 3, 1955, p. 173-182.

To obtain a negative-to-positive image, the process is modified by altering the electrical field above the plate during development. The amount of potential applied to the electrode, which is placed adjacent to the plate, is a function of the specific image being processed. Diagrams, photographs. 7 ref.

2204* Adsorption as a Factor in the Rate of Photographic Development. T. H. James and W. Vanselow. *Photographic Engineering*, v. 6, no. 3, 1955, p. 183-189.

Differences in the photographic behavior of certain classes of developing agents with respect to variations in their adsorption characteristics. Graphs. 19 ref.

2205* Use of Thallium in Photographic Fixing Baths. L. G. Welliver. *Photographic Engineering*, v. 6, no. 3, 1955, p. 203-207.

Correct procedure for using Tl in fixing baths, its advantages and disadvantages. Graphs. 10 ref.

Books and Miscellaneous Publications

2206 Science and Applications of Photography. R. S. Schultze, editor. 664 p. 1955. Royal Photographic Society of Great Britain, London. (TR145 B81s)

Contains the text of papers from the proceedings of the International Conference held in Sept. 1953.

See also: **2198** (aerial photography).

HEAT POWER

2207 Controlling Ballistic Missile Powerplants. Rudolf H. Reichel. *Aero Digest*, v. 71, Dec. 1955, p. 22-27.

For simple powerplants, control by orifices or tank arrangement may be adequate during static firing and airborne operations. For more complex powerplants, or where extended data are needed, automatic controls should be used. Graphs, diagrams. 10 ref.

2208 Bolting Materials for High-Temperature Steam-Plant Service. M. G. Gemmill and J. D. Murray. *Engineering*, v. 180, Dec. 16, 1955, p. 824-827.

An outline of some recent developments in meeting the increasing severe requirements for ferritic bolt steels. Graphs, tables. 3 ref.

2209* Prevention of Scale and Corrosion in the Water Cooling Systems of Internal Combustion Engines. E. L. Streatfield. *Gas and Oil Power, (Annual Technical Review Number)*, v. 50, 1955, p. 315, 316, 319.

Conclusions on the process and distribution of corrosion. Particular attention given to under-water corrosion, with sodium benzoate as an inhibitor. 12 ref.

2210* Causes of Failure in Internal Combustion Engine Valve Springs With Particular Reference to Fatigue. J. H. Darley. *Gas and Oil Power (Annual Technical Review Number)*, v. 50, 1955, p. 335-338.

Typical causes of defects and the use of coatings and mechanical treatment to overcome failures. Tables. 7 ref.

2211* An Investigation of the Factors Contributing to the Failure of Diesel Engine Pistons and Cylinder Covers. D. Fitzgeorge and J. A. Pope. *Gas and Oil Power (Annual Technical Review Number)*, v. 50, 1955, p. 350, 352.

The stresses that occur in combustion-chamber parts are discussed with regard to their nature, magnitude, and likely contribution to failure. The physical and mechanical constants of the material which affect the thermal stresses are given, and the modifying influence of plastic deformation is considered. Diagrams.

2212* A Century in the History of the Reciprocating Internal-Combustion Engine. L. J. Kastner. *Institution of Mechanical Engineers, Proceedings*, v. 169, no. 15, 1955, p. 303-312.

A survey of the practicality of the gas engine and development of lighter, higher-powered fuel engines; considers the Diesel principle and modern compression-ignition engines. Diagrams, photographs.

2213* Corrosion and the Modern Power Station. Edmond C. Potter. *Research*, v. 8, Dec. 1955, p. 450-455.

The problem and cost of corrosion in steam boilers, with particular reference to the power station industry, are discussed, and a program of research is proposed. Photograph, micrographs, diagram. 5 ref.

2214* Oxidation of Heptane in Spark-Ignition Engines. **De l'oxydation de l'heptane dans les moteurs a allumage commandé.** (French.) F. Mauss. *Revue de l'institut français du pétrole et Annales des combustibles liquides*, v. 10, no. 9, Sept. 1955, p. 1126-1133.

Spontaneous ignition and oxidation limits of heptane were studied as functions of fuel air ratio and air temperature by examining pressure variations in a single cylinder engine. Table, graphs, oscillograms. 13 ref.

2215* Liquid Metals—Heat-Exchange Media. **Tekuté kovy —teplosměnná media budoucnosti.** (Czech.) V. Křížek. *Strojirenství*, v. 5, no. 9, Sept. 1955, p. 664-670.

Media with high coefficients of heat transfer. Possibilities of using these metals in making heat-exchangers and steam generators, and applications in atomic electric-power stations. Graphs, tables, photographs, diagrams. 15 ref.

2216 "Futuristic" Rockets Will Soon Provide Economical Energy. James A. Browning. *Welding Engineer*, v. 41, Jan. 1956, p. 30-32.

Use of rocket energy is predicted to have broad applications in industry. Suggested uses include: steam- and flame-cleaning; heating torches; flame-hardening; material atomization; grit and liquid blasting. Diagrams, photographs.

See also: **2228** (pulsating flow in internal combustion engines).

INFORMATION—PREPARATION AND DISSEMINATION

2217* **New Coding Systems Broaden Data Processing.** P. B. Garrott. *Automation*, v. 3, Jan. 1956, p. 70-76.

In order to extend integrated data processing into several diverse areas, dialects of the common language system have been devised. Results provide a vehicle for introduction of automation improvements in fields varying from banking to warehousing. Photographs, diagrams.

2218 Prepare Your Own Catalog Cards. Robert W. Gibson, Jr., Ralph L. Darby, and Melvin C. Koch. *Special Libraries*, v. 46, Dec. 1955, p. 428-433.

A streamlined procedure was developed which reduces both expense and time lag involved. Cards, 3-in. x 5-in., are reproduced by the xerography process. After studies of various sizes of type and reduction ratios, an eight-card format was designed which, when reduced 15% in printing, gives maximum information with good readability. Diagram, photographs. 4 ref.

INSTRUMENTATION AND LABORATORY APPARATUS

2219* **Transverse Shrinkage Tester.** C. W. Mann and C. P. Merhib. *American Leather Chemists Association, Journal*, v. 50, Dec. 1955, p. 584-595; disc., p. 596-598.

Design and construction details for two instruments, one based upon an optical lever system and the other employing an electric circuit. Results obtained by new tester compared with the standard A.L.C.A. method. Tables, graphs, diagrams, micrographs. 4 ref.

2220* **A Remotely Operated Extensometer.** R. G. Berggren and J. C. Wilson. *ASTM Bulletin*, 1955, no. 210, Dec., p. 35-38; disc., p. 38.

Sensitive instrument developed for use in tension testing of highly radioactive metallic specimens. Design, operation, and advantages discussed. Diagrams, photograph. 2 ref.

2221 A Simple Adaptation of the Carbon Replica Technique for the Examination of Selected Areas in the Electron Microscope. D. E. Bradley. *British Journal of Applied Physics*, v. 6, Dec. 1955, p. 430-432.

Includes micrographs, diagrams. 7 ref.

2222 Lamp Equipment for Photochemical Processes. William T. Anderson, Jr. *Chemical Engineering Progress*, v. 51, Dec. 1955, p. 571-572.

Factors are described which are considered in planning for the use of high intensity Hg vapor arc radiation sources, automatically controlled, for the promotion of chemical reactions. Photograph, diagram. 1 ref.

2223* High Vacuum Technique. S. L. Martin. *Chemical & Process Engineering*, v. 36, Dec. 1955, p. 423-428.

Pumping systems and speeds; gages and leak detection; general vacuum techniques; vacuum distillation, evaporation and drying. Photograph, diagram 1 ref.

2224* Different Preparations of Emulsions Sensitive to Charged Particles. **Sur différentes préparations d'émulsions sensibles aux particules chargées.** (French.) François Simon. *Comptes rendus*, v. 241, no. 22, Nov. 28, 1955, p. 1564-1567.

Study and comparison of different processes of preparing sensitive emulsions. A new process producing fine-grain emulsions is introduced. Influence of physical factors is shown. Photograph, micrographs. 6 ref.

2225* Pneumatic Comparator for Measuring Variation in Diameter of Bores. I. G. Morgan and D. C. Barnes. *Engineer*, v. 200, Dec. 2, 1955, p. 795-796.

In conjunction with a suitable reference standard of size it may be used for the absolute determination of diameter. An accuracy of ± 0.00001 in. (±0.25μ) is achieved. Graphs, photographs, diagrams. 4 ref.

2226 Standards for a Strong America. Fifth National Conference on Standards and the Thirty-Sixth Annual Meeting of the American Standards Association Proceedings (Annual Volume), v. 36, 1954, 97 p. American Standards Association, New York. (T59 N21p)

Papers on standards for architecture, safety, electricity, surface finishes, agriculture, color television and industry. The standards, approved by the American Standards Association, encompass the whole fabric of production, distribution, and consumption of goods and services.

2227 The Construction of 'Mock-Up' Laboratory Furnaces. P. K. C. Wiggs. *Fuel Efficiency*, v. 4, Nov. 1955, p. 132-133.

The hot face insulating bricks, "crusilite" heating elements, and other parts used in the two designs of furnaces preparatory to installation of a laboratory furnace, and their costs are discussed. Photographs.

2228* Pulsating Flow Measurement by Viscous Meters, With Particular Reference to the Air Supply of Internal-Combustion Engines. L. J. Kastner and T. J. Williams. *Institution of Mechanical Engineers, Proceedings*, v. 169, no. 26, 1955, p. 419-432; disc., p. 433-444.

Development of an accurate meter, suitable under the most severe conditions of pulsating flow. Diagrams, graphs, table. 31 ref.

2229 Device Improves Thermocouple Pyrometer Operation. D. H. Jones. *Iron Age*, v. 176, Dec. 15, 1955, p. 108-109.

Annealing practices are improved by equipment for detecting and temporarily repairing thermocouple circuit faults. Photographs.

2230 Coreless Induction Furnace. K. Scherzer and F. S. Leigh. *Iron & Steel*, v. 28, Dec. 1955, p. 669-672.

Design, construction, and performance data for furnaces now in England, Germany, and U. S. Graphs, diagrams, photographs. (To be continued.)

2231* Power Plant Flow Metering. L. A. Dodge. *ISA Journal*, v. 2, Dec. 1955, p. 545-547.

Application of fluid meters that measured rate of flow in closed conduits or pipe lines. Tabulates advantages and disadvantages of orifices, flow nozzles, and Venturi tubes, and applications of each. Graphs, diagrams, tables.

2232 A Microbeam Back-Reflection X-Ray Camera. D. Lewis. *Journal of Scientific Instruments*, v. 32, Dec. 1955, p. 467-468.

Direct and accurate optical method of specimen location developed to be used with the camera. Exposure times were greatly reduced. Diagram, micrographs. 4 ref.

2233 pH Control. Everett A. Hodges. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 503-504, 506-508. (T13 M56f)

Colorimetric and electrometric methods for testing the pH of plating baths 4 ref.

2234* Gas Analyzers for Efficient Furnace Operation. E. C. Lang. *Metal Treating*, v. 6, Nov.-Dec. 1955, p. 10 + 5 pages.

Flexible, portable type instrument provides information regarding conditions in all phases of combustion processes in all parts of the furnace. Diagrams, photographs, graphs, table.

2235* A High Power Industrial Fluoroscopic Tube. D. T. O'Connor and E. L. Criscuolo. *Nondestructive Testing*, v. 13, Nov.-Dec. 1955, p. 18-19, 26.

Describes both the failures and successes of two unusual X-ray tube designs which permit a target loading many times greater than that of conventional tubes. Photographs, diagram.

2236* Selection of Sources for Radiographic Use. Marvin G. Schorr. *Nondestructive Testing*, v. 13, Nov.-Dec. 1955, p. 20-22, 26.

Characteristics of the more common isotopes as they offset radiography; costs of sealed sources; selection of source for different applications. Tables, graphs.

2237* Practical Conductivity Measurement for the Electrical Industry. William A. Cannon, Jr. *Nondestructive Testing*, v. 13, Nov.-Dec. 1955, p. 32-34.

Applications of the Magnatest FM-100 conductivity meter to maintain close control over casting and heat traveling techniques in non-ferrous foundries, sorting mixed alloys and in the electrical hardware industry. Photographs, table.

2238* X-Ray Intensity Measurements With Counter Tubes. W. Parrish. *Philips Technical Review*, v. 17, Jan.-Feb. 1956, p. 206-221.

Discussion of the various problems involved in quantitative radiation intensity measurement with counter tubes. Diagrams, graphs, photographs, tables. 16 ref.

2239 An Optically Focusing X-Ray Diffraction Camera. A. Franks. *Physical Society, Proceedings*, v. 68, no. 432B, Dec. 1955, p. 1054-1064.

To obtain low angle diffraction photographs the focusing is accomplished by total external reflection either by one elastically bent optical flat to form a line focus, or by two crossed flats to form a point focus. The beam is partially monochromatized and its intensity is high. Diagrams, graphs. 22 ref.

2240* Detecting Flaws in Traction Gears. *Railway Locomotives and Cars*, v. 129, Dec. 1955, p. 66-69.

Explains how many gear failures can be avoided without scrapping. Photographs.

2241* X-Ray Microscopy. W. C. Nixon. *Research*, v. 8, Dec. 1955, p. 473-483.

Development, merits, and limitations of each of three forms of X-ray microscopes is discussed, based on the principles of reflection, contact, and projection. Diagrams, photographs, micrographs. 102 ref.

2242* Introduction Into Industry of Tungsten-Molybdenum Thermocouples for Measurement of Liquid Steel Temperatures. **Promyshlennoe vnedrenie volfram-molibdenovykh termopar dlia izmereniia temperatury zhidkoi stail.** (Russian.) S. K. Danishevskii. *Stal'*, v. 15, no. 11, Nov. 1955, p. 984-989.

An inexpensive thermocouple to determine temperatures up to 2400 C for short periods. Photographs, table, graphs, diagrams. 4 ref.

2243* Temperature Control of Steel During Pouring. **Kontrol' temperatury stali pri razlivke.** (Russian.) V. G. Gruzin. *Stal'*, v. 15, no. 11, Nov. 1955, p. 989-993.

Application of W-Mo thermocouple for constant control of temperature in the ladle making possible casting at an optimum temperature. Tables, diagrams, photographs. 4 ref.

2244 Some Modifications and Techniques Applied to the RCA Type EMU Electron Microscope. F. W. Bishop. *University of California, Los Angeles Campus, School of Medicine (U. S. Atomic Energy Commission)*, UCLA-354, Nov. 1955, 33 p. (UF767 Un3.1uc)

Compilation of unpublished information on small modifications or improvements in the electron microscope which have been made within the last 5 or 6 yr. Diagrams, micrographs, photograph.

LUBRICATION AND FRICTION

2245* Development of a Method for Determining the Oil Separation Tendencies of Multipurpose Greases. S. Fred Calhoun. *ASTM Bulletin*, 1955, no. 210, Dec., p. 45-49.

Describes test-tube and pressure methods for determining bleeding tendencies. Advantages of latter method discussed. Photographs, graphs, diagrams, tables. 6 ref.

2246 How Oil Viscosity Affects Piston Ring Wear. M. Popovich and L. E. Johnson. *Automotive Industries*, v. 114, Jan. 1, 1956, p. 56-57, 106.

Tests correlate engine wear with oil viscosity. Viscosity range of S.A.E. 10 to 20 appears ideal. Graphs, diagram.

2247* Plain-Bearing Fatigue Testing. E. D. Brailey and W. J. Donnelly. *Communications and Electronics*, v. 3, Jan. 1956, p. 16-18.

Testing of engine-bearing systems using electronic and hydraulic techniques. Diagrams, photographs, graph.

2248* Aging Phenomena of Engine Lubricating Oils. **Über Alterungserscheinungen von Motorenschmierölen.** (German.) Michael Freund. *Erdöl und Kohle*, v. 8, no. 10, Oct. 1955, p. 712-718.

Investigation methods for oil slime formation and precipitation deposits; changes produced by oil additives. Tables, micrographs. 25 ref.

2249* Some Problems in Lubrication and the Substances Called Additives. A. Towle. *Institution of Mechanical Engineers, Automobile Division, Proceedings*, no. 2, 1954-55, p. 57-66 + 4 plates; disc., p. 66-83.

Function, specifications, and types of lubricating oil additives as essential components of the petroleum industry. Graphs, tables, photographs, micrographs. 13 ref.

2250* Studies on Ball Bearing Steels. II. Effect of Some Metallurgical Factors on Life of Ball Bearing Steels. (Japanese.) Manabu Ueno, Tetsutaro Mitsuhashi, and Yutaka Nakano. *Iron & Steel Institute of Japan, Journal*, v. 41, no. 10, Oct. 1955, p. 1102-1107.

To determine the relation between some metallurgical factors and life, chemical composition, non-metallic inclusions, hardness, compressive load of inner rings, cementite content, grain size, and forging degree were tested. Graphs. 5 ref.

2251 Some Unusual Conditions Encountered in the Lubrication of Rolling Contact Bearings. T. W. Morrison. *Lubrication Engineering*, v. 11, Nov.-Dec. 1955, p. 405-411.

Discusses lubricant requirements for operation at very low speeds and heavy loads, fretting corrosion in rotating bearings, effect of variation in lubricant on endurance of bearings. Diagrams, graphs, table, photographs. 5 ref.

2252 Millions of Balls—Millionth Tolerances. Edwin H. Goodridge, Jr. *Machinery*, v. 62, Dec. 1955, p. 143-151.

Manufacturing process for balls to be used in bearings and various applications. Diagrams, photographs.

2253 Selection, Care, and Installation of Anti-Friction Bearings. E. P. Stahl. *Machinery*, v. 62, Dec. 1955, p. 174-182.

Sealing, care, and installation of ball and rolling bearings. Diagrams, table.

2254 The Life of Ball and Roller Bearings. R. H. Warring. *Machinery Lloyd (Overseas Ed.)*, v. 27, Dec. 3, 1955, p. 69, 71, 72.

Discusses various factors of failure with particular attention given to fretting corrosion. An empirical formula to determine expectant life is presented. Table.

2255 Jet Fuel Stability Studies. C. M. Barringer. *SAE Journal*, v. 63, Dec. 1955, p. 39-41.

Reports the efforts of DuPont, Socony, and Shell to improve jet fuel. Micrographs, diagram. 1 ref.

2256* Basic Dynamic Capacity of Roller Bearings. **Základní dynamická únosnost valivých ložisek.** (Czech.) Vl. Dušek. *Strojírenství*, v. 5, no. 9, Sept. 1955, p. 659-663.

Durability of roller bearings. Principles for calculating dynamic capacity. Mathematical relation between durability and stress. Graphs, photograph, diagrams. 8 ref.

2257* Use of Plastics With Fabrics for Making Bearings and Bushings. **Použití tvrzených tkanin na kluzná uložení.** (Czech.) J. Vinš. *Strojírenství*, v. 5, no. 11, Nov. 1955, p. 845-847.

Strength, pressability, and machinability of fabric-reinforced plastics. Maximum loads, mounting, lubrication, and cooling of bushings and bearings of these materials. Tables, graphs.

2258* Investigation of Action Mechanism of Anti-Corrosion Additions to Oils by Using Radio-Active Indicators. **Issledovanie mekhanizma deistviia antikorrozionnykh prisadok k maslam metodom radioaktivnykh indikatorov.** (Russian.) Iu. S. Zaslavskii, S. E. Krein, and R. N. Shneerova. *Zhurnal fizicheskoi khimii*, v. 24, no. 10, Oct. 1955, p. 1815-1821.

Investigation of anti-corrosion oil-film formation on metal surfaces by additions of radioactive S and P. Relationship between the protecting film and temperature of the oil. Discusses the complex problem of film formation and the diffusion of S in metal and oil. Graphs. 2 ref.

Books and Miscellaneous Publications

2259* **Knife-Edge Bearings.** P. J. Geary. B.S.I.R.A. Bibliographical Survey of Instrument Parts No. 2. 61 p. 1955. British Scientific Instrument Research Association, Kent, England. (ZTJ1061 G26k)

Emphasizes design and properties of bearings to indicate areas where more fundamental research might be undertaken. A comprehensive bibliography is included which covers the period from about 1900 to date.

MECHANICAL ENGINEERING

2260 On the Danger of Combined Stresses in Pressurized Structures. M. Zaustin. *Aeronautical Engineering Review*, v. 14, Dec. 1955, p. 45-48.

Failure of the Comets is explained in terms of fuselage shell brittleness. Points out the need to replace the tensile theory of the strength of materials with a new criterion. Diagram.

2261* Effect of Yielding on the Fatigue Properties of Test Pieces Containing Stress Concentrations. K. Gunn. *Aeronautical Quarterly*, v. 6, Nov. 1955, p. 277-294.

A method of estimating the fatigue properties of notched test pieces when cyclic loads are applied in the presence of mean stresses is described. The method takes into account the local yielding which occurs near the base of the notch when the nominal stresses are sufficiently high. Graphs, diagrams. 4 ref.

2262 Forced Vibration With Damping. D. A. Richards. *American Journal of Physics*, v. 23, Dec. 1955, p. 557-561.

Experimental determination of the response curves for forced vibration with velocity damping, using a moving-cell galvanometer. The mechanism for producing a sinusoidal e.m.f. of continuously variable frequency ranging from zero to 0.4 c.p.s. is described, together with a method for the determination of the phase angle between the driving force and the motion of the driven system. Experimental results, obtained with the apparatus, both for response curves and phase angle measurements, and various values of damping are summarized. Diagrams, tables, graph.

2263 Low Cost Gas Turbine Blades a Must for Automobile Use. Donald N. Frey. *Automotive Industries*, v. 114, Jan. 1, 1956, p. 52-53, 109-110.

Low cost investments and elimination of wax or plastic patterns appear to partially answer the problems involved in producing inexpensive but suitable parts. Photographs.

2264 Automatic Production Methods at Detroit Transmission Division of GM. Joseph Geschelin. *Automotive Industries*, v. 114, Jan. 1, 1956, p. 66-70, 105-106.

To meet the accelerating demand for automatic transmissions, facilities have been greatly expanded. Some of the innovations exemplifying latest automation practices are highlighted. Photographs.

2265 Developments in Collapsible Metal Tube Packaging. Lester B. Platt. *Drug and Cosmetic Industry*, v. 77, Dec. 1955, p. 779 + 5 pages.

Methods of solving the special problems of liners caused by the unusual chemical composition of the new "wonder" drugs. Photographs.

2266* Tensile Stripping Tests on B.S.W. ¾ in-10 T.P.I. Threads. J. E. Field. *Engineer*, v. 200, Dec. 23, 1955, p. 901-902.

Static stripping tests were carried out on high tensile steel bolts and nuts, high tensile bolts with mild steel nuts and on low tensile steel bolts with high tensile nuts to determine the relationship between nut height and stripping strength of assemblies. Diagram, graph, tables.

2267 Testing the Reliability of Complicated Machines. A Method to Limit the Cost of Prototype Trials. G. Morris. *Engineering*, v. 180, Nov. 25, 1955, p. 723-726.

Presents systematic method for the study of reliability data obtained during the development trials of complicated machines. In addition, an idealized model representing any prototype system is proposed and the appropriate mathematics developed. Graphs, tables. 3 ref.

2268 An Apparatus for Obtaining the Tensile Properties of Irradiated Materials at Elevated Temperatures. R. E. Hueschen and D. C. Kaulitz. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-38991, Sept. 1955, 22 p. (UF767 Un3.1hw)

Describes a tensile-testing unit which permits testing of highly-radioactive specimens at temperatures up to 800 C. The vacuum tensile furnace, mounted on a 60,000 lb. Baldwin tensile machine, is constructed to permit measurement of elongation by a newly developed optical instrument. Graphs, table, diagrams, photographs.

2269* Oil Burner Problems. Tank Failure. Charles H. Burkhardt. *Heating & Air Conditioning Contractor*, v. 47, Dec. 1955, p. 36-39.

Includes diagrams.

2270 Highway Research Board, Proceedings (Annual Volume), v. 34, 1955, 648 p. National Academy of Sciences–National Research Council, Division of Engineering and Industrial Research, Washington, D. C. (TE1 H53p)

Forty-seven papers covering economic, finance, and administration, design, materials and construction; maintenance; traffic and operations; and soils.

2271* Some Experiences in Engineering. C. L. Forbes. *Institution of Mechanical Engineers, Proceedings*, v. 169, no. 24, 1955, p. 401-406 + 2 plates.

Hydraulic pumps, sporting ammunition, static electricity, magnetic lathes, turbine governors, boring machines, transfer cars, cold heading, and expellers are surveyed. Diagrams.

2272 The Instability of Testing Machines. A. H. Chilver. *Institution of Mechanical Engineers, Proceedings*, v. 169, no. 25, 1955, 407-418.

Demonstration of buckling of a simple testing machine as an elementary problem in elastic stability. The theory of instability is in agreement with results on both model and full-size compression testing machines. Diagrams, graphs, table, photographs. 2 ref.

2273* Dynamic Analysis and Control of a Process Pump. R. P. Bigliano. *ISA Journal*, v. 2, Dec. 1955, p. 536-539.

Describes actual control problem and its solution by systematically measuring process dynamics and synthesizing a control system to give desired performance. Diagrams, graphs, table.

2274 An Investigation of the Bending of Angle Beams in the Plastic Range. H. Norman Abramson, Harry A. Williams, and Bruce G. Woolpert. *Journal of the Aeronautical Sciences*, v. 22, Dec. 1955, p. 818-828.

Attempts to determine to what extent a relationship between bending moment at the mid-span and outer fiber stress will agree with the applied end moment if a simplified theoretical approach is used in the analysis. Photographs, graphs, tables, diagrams. 17 ref.

2275 Elastic-Stress Waves Produced by Pressure Loads on a Spherical Shell. J. H. Huth and J. D. Cole. *Journal of Applied Mechanics*, v. 22, Dec. 1955, p. 473-478.

Treats the problem of stresses in a spherical elastic shell subjected to a plane pressure wave traveling across it with a constant speed, a case of technical interest when considering the effect of blast waves on the structure of a missile in flight. Graphs. 9 ref.

2276 Plastic Deformations of a Free Ring Under Concentrated Dynamic Loading. R. H. Owens and P. S. Symonds. *Journal of Applied Mechanics*, v. 22, Dec. 1955, p. 523-529.

Attempts to determine the deformations of the ring when the force magnitudes are such that plastic strains, large compared with elastic strains, occur. By neglecting elastic strains and assuming ideally plastic behavior, approximations to the final deformations of the ring are obtained. Graphs, diagrams. 5 ref.

2277 Torsion of Circular Shafts of Variable Diameter. M. M. Abbassi. *Journal of Applied Mechanics*, v. 22, Dec. 1955, p. 530-532.

By using spherical polar coordinates, the stress function for circular shafts of variable diameter is expressed in terms of the Legendre associated functions of the second order. It is obtained for various curves forming the generating surface of the shaft. Diagram. 10 ref.

2278* Strength of Structural Parts of Plate Girders. (Japanese.) Yoshiaki Tada and Takayoshi Shiraishi. *Journal of Railway Engineering Research (Japan)*, v. 12, nos. 16-17, Sept. 10, 1955, p. 389-433.

Ultimate load-bearing strength of each member of the test girders was calculated and showed that the compressive flange has the least strength, yet it has a safety factor as high as 2.6 to 3.1; the web has a higher strength; and the strength of stiffeners was excessive. Diagrams, tables, graphs, photographs. 4 ref.

2279 Automatic Engine Assembly on a Transfer Machine. Charles H. Wick. *Machinery*, v. 62, Dec. 1955, p. 166-172.

Intermittent movement permits use of automatic nut-running machine units, resulting in closely controlled torque application. Photographs.

2280 Essentials of Plating Rack Design. William E. Belke. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 41 + 9 pages. (T13 M56f)

Primary factors to consider for specific application in production plating. Diagrams, tables.

2281 The Effective Width in the Plastic Range of Flat Plates Under Compression. III. M. Botman. *Netherlands Nationaal Luchtvaartlaboratorium Reports* S. 465, June 1955, 12 p. + 84 plates. (TL526.N3 N38.5r)

Results are given of tests on 18 plates, 10 of which are made of Al alloy 75 S-T and 8 of Al alloy 2S-½H. Tables, graphs, photographs.

2282 Liquid Springs for Vehicles. Paul H. Taylor. *SAE Journal*, v. 63, Dec. 1955, p. 30-33.

Compressibility; sealing; high-pressure chambers; and mass-production problems. Photographs, diagram.

2283* Stresses in Reinforced Sheet or Plate. **Namáhání vyztužených desek.** (Czech.) V. Placák. *Strojírenství*, v. 5, no. 9, Sept. 1955, p. 643-651.

Calculation of bending and twisting stresses in infinitely long plates strengthened by variously shaped ribs or braces. Equations for internal and external deformation work and forces. Critical shear stress. Diagrams, photographs. 18 ref.

2284* Resonance Vibrations of Structures When Passing Through Critical Speeds. **Resonanční kmitání konstrukcí při rychlém přejíždění kritických otáček.** (Czech.) Vl. Kopřiva and Fr. Turek. *Strojírenství*, v. 5, no. 9, Sept. 1955, p. 652-657; disc., p. 658-659.

Decrease of amplitudes of vibrations during rapid passage through critical zones, and determination of shape of resonance curves for rotational and piston machines. Diagrams, graphs, table, photograph. 4 ref.

2285 Stresses From Radial Loads and External Moments in Cylindrical Pressure Vessels. P. P. Bijlaard. *Welding Journal*, v. 34, Dec. 1955, p. 608S-617S.

Design information on deflections, bending moments and membrane forces, and on the influence of internal pressure. Diagrams, graphs, tables. 4 ref.

METALLURGY

2286* Rail Transport of Hot Ingots. (English.) *Aciers fins & spéciaux français*, 1955, no. 21, Nov., p. 17-19.

Novel process may improve operations in French steel industry. Photographs, diagram.

2287* Banding Hollow Bodies in High-Tensile Steel Wire. (English.) *Aciers fins & spéciaux. français*, 1955, no. 21, Nov., p. 51-54.

Steel wire banding and coiling lessens weight of pressure vessels giving a product with greater safety. Photographs.

2288* Jointed Metal Furnace Hearths and Regulators (System Javelle). (English.) *Aciers fins & spéciaux français*, 1955, no. 21, Nov., p. 66-70.

Expanding usage of jointed hearths and regulators is noted. Diagrams, photographs, table.

2289* Utilisation of Steel in the Construction of Multi-Level Car Parks. (English.) J. J. Thiry. *Acier, Stahl, Steel*, v. 20, no. 11, Nov. 1955, p. 435-440.

Design of some German and American car parks and advantages of steel in their construction. Photographs, diagrams.

2290 American Experience With Magnesium Alloys. H. Wilkin Perry. *Aircraft Engineering*, v. 27, Dec. 1955, p. 416-417.

Details of recent work on aircraft primary structures in Mg. Photographs, tables.

2291 Calibrated Tension-Bolt. *Aircraft Production*, v. 17, Dec. 1955, p. 492-493.

Describes two current techniques of assessing load in bolts. Specially designed bolt that can be pretensioned to a specified load overcomes some of the limitations of these systems. Graphs, diagrams.

2292* Light-Metal Nails. **Nägel aus Leichtmetall.** (German.) E. Nachtigall and H. Landerl. *Aluminium Ranshofen, Mitteilungen*, v. 3, no. 2, Oct. 1955, p. 36-40.

Calculation of bending stress; relation between material characteristics and diameter; comparison with commercial steel nails; suggestion for suitable nail shape; application of Al materials. Tables, graphs, photographs.

2293* Effects of Pressure on Binary Alloys. III. Five Alloys of Thallium, Including Thallium-Bismuth. IV. Six Alloys of Bismuth. P. W. Bridgman. *American Academy of Arts and Sciences*, v. 84, no. 1, p. 1-109.

Complications in phase diagrams resulting from the presence of the pressure transistions of the main components. Tables, graphs, phase diagram. 22 ref.

2294* Miscellaneous Effects of Pressure on Miscellaneous Substances. P. W. Bridgman. *American Academy of Arts and Sciences*, v. 84, no. 1, p. 111-129.

Electrical resistance, compression, shearing strength, tensile properties, and permanent density change of various materials. Tables, photograph. 17 ref.

2295 *American Machinist (1956 Production Planbook Issue)*, v. 99, Mid-Nov. 1955, 570 p. (TJ1 Am35mb)

A classified file of idea cores, cited from issues of the past year, comprising a study of new metal-working ideas for future planning. Special report on the working of non-ferrous metals.

2296 How to Work Non-Ferrous Metals. *American Machinist (1956 Production Planbook Issue)*, v. 99, Mid-Nov. 1955, p. 17-128. (TJ1 Am35mb)

Presents concise information regarding heat treating, machining, forming, forging, joining, and finishing. Tables, diagrams, photograph, graphs.

2297 Brass and Bronze Alloys. O. R. Scott. *Canadian Metals*, v. 18, Dec. 1955, p. 30-32, 34.

Describes some of the more common brasses and bronzes in use and cites a few precautionary measures for producing good commercial castings. Photographs.

2298 Aluminum Alloys Move Into Structural Markets. J. M. Pickett. *Civil Engineering*, v. 25, Dec. 1955, p. 44-47.

Increasing the tensile strength of Al, by perfecting its alloys, increases its structural applications. Photographs.

2299* Two Special Alloy Steels. *Edgar Allen News*, v. 34, Dec. 1955, p. 270-271.

Describes two steels: one designed to resist shock and abrasion while being adaptable by heat-treatment to a considerable number of parts; the second is primarily designed to overcome temper brittleness. Table, graphs.

2300 Effects of Processing on Magnetic Alloys. Robert H. Trapp. *Electrical Manufacturing*, v. 57, Jan. 1956, p. 110-113.

A discussion of the variables in processing steps which control the physical and magnetic properties of magnetic alloys. Graph, micrographs.

2301* For Better Quality of Safety Razor Blades. **Za lepší jakost holicích čepelek.** (Czech.) Vladimír Sekanina. *Hutnické listy*, v. 10, no. 11, Nov. 1955, p. 665-673.

Czechoslovakian methods for producing razor blades are compared with procedures in other countries. Tight production control measures are required to make a high quality product. Tables, micrographs, diagrams. 5 ref.

2302 Russian Iron and Steel Industry. Robert Shone and W. F. Cartwright. *Iron & Steel*, v. 28, Dec. 1955, p. 655-659.

Productivity and incentives; raw materials and plant equipment.

2303 Scrap Preparation and Contamination. R. F. Kuhnlein. *Iron and Steel Engineer*, v. 32, Dec. 1955, p. 120-123.

Some problems of scrap contamination and methods for eliminating contaminants.

2304* Influence of Cu on Spring Steel (Sup 6). II. (Japanese.) Toshio Kodaira and Yoichi Yasuda. *Iron and Steel Institute of Japan, Journal*, v. 41, no. 10, Oct. 1955, p. 1098-1102.

Influences of Cu content on the properties, at ordinary temperatures, of Si-Mn spring steel. Graphs, table. 5 ref.

2305* Investigation of Boron Steel. II. (Japanese.) Sadao Koshiba, Kazuo Tanaka, and Asao Inata. *Iron & Steel Institute of Japan, Journal*, v. 41, no. 10, Oct. 1955, p. 1108-1112.

Effects of 0.003 and 0.006% B on the transformation, hardenability, quenched and tempered hardness, and mechanical properties of Mn-Cr and Mn-Cr-Mo high tensile steels. Table, graphs, micrographs. 1 ref.

2306 Gettering of Gas by Titanium. Virgil L. Stout and Martin D. Gibbons. *Journal of Applied Physics*, v. 26, Dec. 1955, p. 1488-1492.

Methods used in gas sorption studies; specific gases and their reaction with Ti. Diagrams, graphs, table. 11 ref.

2307 The 1955 Specification Revisions. E. Elliott. *Light Metals*, v. 18, Dec. 1955, p. 409-412.

Composition and mechanical properties of the Al alloys and a guide to the selection of casting alloys. Tables.

2308 Modern Stainless Steels. J. Lomas. *Machinery Lloyd (Overseas Ed.)*, v. 27, Dec. 17, 1955, p. 95-98.

Current assessment of the steels with respect to new developments, modifications, and discoveries, together with the physical and mechanical properties for different groups. Table.

2309 Commercial Tolerances for Compression Springs. I. *Mainspring*, v. 16, Dec. 1955, p. 3-6.

Tolerances for coil and spring diameters, free length, and commercial load. Tables, diagram.

2310 Magnesium in the Volkswagen. L. C. Boehner. *Metal Industry*, v. 87, Dec. 2, 1955, p. 469-470.

Methods used in production of transmissions, engines, and axles, and the advantages derived from use of magnesium in these parts. Table.

2311 Modern Reclamation of Non-Ferrous Metals. S. W. Platt. *Metal Industry*, v. 87, Dec. 23, 1955, p. 523-526.

General discussion of the origin and types of scrap and its distribution. Photographs. (To be continued.)

2312* Improvement of Composition of Tool Steels. **Ob uluchshenii sostava instrumental'nykh stalei.** (Russian.) Iu. A. Geller. *Metallovedenie i obrabotka metallov*, 1955, no. 3, Sept., p. 1-16.

Comprehensive review of tool steels for different operations now used in USSR and their improvement through composition and heat treatment. Tables, graphs. 18 ref.

2313 A Dictionary of Metallurgy. A. D. Merriman and J. S. Bowden. *Metal Treatment and Drop Forging*, v. 22, Dec. 1955, p. 532-538.

Defines "roke" to "rust remover". Diagrams, tables, graph. (To be continued.)

2314* Expanded Aluminum. *Modern Metals*, v. 11, Dec. 1955, p. 40, 42.

Advantages of this form over solid sheets; methods for producing both standard and flattened types, fabrication methods, and applications. Photographs.

2315 Final Report on Development and Testing of Nickel-Molybdenum Alloys. F. C. Monkman, Jr., N. J. Grant, and C. F. Floe. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-1990, Nov. 1955, 43 p.

Determines the effect of vacuum melting and variations in composition on the ductility, mechanical and stress-rupture properties of nickel-molybdenum alloys. Tables, diagrams, graphs, micrographs.

2316* Industrial Experiments With the Production of Spheroidal Graphite Machine Castings. **Gömbgrafitos gépöntvénygyártás üzemi kísérletei. II.** (Hungarian.) Miklós Cseh. *Öntöde*, v. 6, nos. 11-12, Nov.-Dec. 1955, p. 274-283.

Properties and heat treatment of the annealed cast iron; effects of slags; economic considerations. Diagrams, tables, micrographs, graphs. 11 ref.

2317* Rem-Cru C-130AM. *Rem-Cru Titanium Data Sheet*, 1955, Nov., 12 p.

Design, applications, physical and mechanical properties of 4% Al, 4% Mn, and 92% Ti alloy. Tables, graphs. 3 ref.

2318 Physical Metallurgy. A. R. Bailey. Paper from REPORTS ON THE PROGRESS OF APPLIED CHEMISTRY. v. XXXIX. p. 85-104. 1954. Society of Chemical Industry, London. (TP1 So13r)

Metallographic techniques; deterioration of metal under stress; solidification process in metals; crystallization and structure of cast iron; and solid-state transformations. 216 ref.

2319* Grade Data for Unalloyed Steels as Manufactured in Italy According to the Iron and Coal European Community Production Program. **Facteurs de'évaluation de la qualité des aciers non alliés en Italie dans le programme de production C.E.C.A.** (French.) G. Zanini Zazinovich. *Revue de métallurgie*, v. 52, no. 11, Nov. 1955, p. 895-908.

Properties of unalloyed Italian structural steels are presented according to C.E.C.A. agreement. Tables.

2320* The Alloy Al Zn5.5 Mg2 Cu2 (Cr) and Its Pecularities. **Zlitina Al Zn5,5 Mg2 Cu2 (Cr) in njene posebnosti.** (Slovenian.) Viktor Fettich and Anton Urbanc. *Rudarsko-metalurški zbornik*, 1955, no. 3, p. 197-207.

Small amounts of Cr were added to an alloy. Properties and forming characteristics were determined. Best results were obtained by solution-heating at 475 C for 20 to 30 min. quenching in cold water and age-hardening for 16 to 18 hr. at 120 C. Graphs, tables. 3 ref.

2321 The Properties and Uses of Fortiweld Steel. H. F. Tremlett. *Sheet Metal Industries*, v. 32, no. 344, Dec. 1955, p. 885-888; disc., p. 902-906, 922.

Particular emphasis placed on properties of interest to sheet-metal users. Techniques for working into fabricated sheet-metal components. Tables.

2322 The Properties of Hiduminium 100 (S.A.P.) in Sheet Form. W. M. Doyle. *Sheet Metal Industries*, v. 32, no. 344, Dec. 1955, p. 889-898; disc., p. 902-906, 922.

Manufacturing process is described and physical property data, such as tensile strength, creep strength, fatigue endurance, physical constants, corrosion resistance, and formability, are given. Graphs, tables, diagrams, micrograph, photographs. 8 ref.

2323 Nimonic Alloys and Other Heat-Resistant Materials in Sheet Form. H. E. Lardge. *Sheet Metal Industries*, v. 32, no. 344, Dec. 1955, p. 899-902; disc., p. 902-906, 922.

Discusses some new alloys and new applications for alloys formerly used in other forms. Requirements of gas-turbine aircraft engines considered. Tables, photographs.

2324* Use of Metallurgical Slags for the Construction of Roads and Airfields in Holland. **L'emploi des laitiers métallurgiques dans la construction des routes et aérodromes aux Pays-Bas.** (French.) D. Thoenes. *Silicates industriels*, v. 20, no. 10, Oct. 1955, p. 370-372; disc., p. 372-373.

Mechanical and chemical properties; presence of undesirable additions; classification of granules. Graphs, micrographs, photographs.

2325 Technical Progress. *Steel (Metalworking Yearbook Issue)*, v. 138, Jan. 2, 1956, p. 195 + 100 pages.

Brief comments by metalworking experts in the fields of steel making, non-ferrous production, materials, metallurgy, heat treating, testing, drives, controls, machining, tooling, forming, cleaning, finishing, joining, packaging, lubrication, service, and maintenance. Photographs.

2326* Rare-Earth Metals in Metallurgy and Casting. **Metale ziem rzadkich w metalurgii i odlewnictwie.** (Polish.) Janusz Czerminski. *Wiadomości hutnicze*, v. 11, no. 10, Oct. 1955, p. 306-311.

Content of rare-earth metals and some other metals in earth's crust and their use in steel making and in castings, and their effect on cast iron and steel structure. Micrographs, tables, photograph, graph.

2327* Industrial Safety and Hygiene in Plant Area Activities of the Open-Hearth Steel Mill. **Bezpieczeństwo i higiena pracy w ruchu placowym stalowni martenowskiej.** (Polish.) Józef Splewiński. *Wiadomości hutnicze*, v. 11, no. 10, Oct. 1955, p. 311-315.

Storage and handling of charge materials; preparation and flame-cutting of scrap; handling of scrap equipment; general safety rules.

See also: **2681** (Mn economics in Spain).

METALS—EXTRACTION AND REFINING

2328 Refining Antimony by Electrodeposition and by Distillation. R. R. Rogers and R. A. Campbell. *Canada, Department of Mines and Technical Surveys, Mines Branch, Technical Paper No.* 11, 1955, 14 p. (TN41 C16t)

The degree of refinement by distillation, electrodeposition, and a combination of the two methods varied with the crude material, and the refining methods used. Tables, photographs, diagram. 6 ref.

2329 Recent Developments in the Processing of Uranium Ores and Their Significance in the Extractive Metallurgy of Metals. R. R. Grinstead. *Dow Chemical Company, Western Division (U. S. Atomic Energy Commission)*, AECU-3071, Sept. 1955, 33 p. (UF767 U3au)

Describes the application of the techniques of solvent extraction processing, and the possibility of relating uranium recovery developments to methods of extracting other metals from their ores. Diagrams, graphs.

2330* Purity of Metals. **La purezza dei metalli.** (Italian.) Giuseppe Pani. *Fonderia*, v. 4, no. 10, Oct. 1955, p. 465-469.

Production methods, characteristic properties, and the fields of application. Tables, diagrams, graphs. 3 ref.

2331 Zirconium Metal Fines Recovery. Low Hafnium Zirconium Project. S. C. Ogburn, Jr. and L. J. Reader. *Foote Mineral Company (U. S. Atomic Energy Commission)*, NYO 1093, Jan. 1951, 15 p. (UF767 U3ny)

Laboratory and pilot plant investigation of recovery of fines resulting from the manufacture of Zr sponge and Zr crystal bar. Diagrams, photographs, flowsheet, tables.

2332 Sodium Uranium(IV) Fluoride; Precipitation and Reduction to Metal. W. B. Tolley. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-39087, Sept. 1955, 13 p. (UF767 Un3.1hw)

Determines possibility of precipitating a U Na salt from uranyl solution, to obtain some solubility data during precipitation, and classifies the structure of compound obtained. Tables, photograph. 5 ref.

2333* Influence of the Shape of Ingots and Teeming Time of Surface Defects. **Influencia de la forma de los lingotes y el tiempo de llenado de los mismos, sobre los defectos superficiales.** (Spanish.) Apolinar Herrero. *Instituto del hierro y del acero*, v. 8, no. 38, July-Sept. 1955, p. 365-369.

Discusses necessity of appling different casting methods, depending on shape and size of the ingots, and of a perfect heat control of the steel before casting. Table, graphs. 1 ref.

2334 Continuously Cast Large Bronze Shapes. *Iron Age*, v. 176, Dec. 8, 1955, p. 143-145.

Water-cooled graphite dies and gravity-feed, bottom-flow casting technique produces large bronze bearings, bushings, gears, and other parts that can be machined with minimum waste of time and material. Photographs.

2335 Rational Distribution of Stock in a Blast Furnace T. An. Tesch. *Iron and Steel Engineer*, v. 32, Dec. 1955, p. 125-126, 129, 131.

Selective charging system results in fuel economy, increased production, and uniform operation. Table, diagrams, photographs.

2336* Problems in the Production of Titanium. **Problem inom titanets metallurgi.** (Swedish.) Gotthard Björling. *IVA tidskrift för teknisk-vetenskaplig forskning*, v. 26, no. 6, 1955, p. 252-257.

Titanium tetrachloride, as the intermediate compound, is reduced by Mg or Na after refining. The sponge is melted and cast in a vacuum arc furnace.

2337 Survey of Stainless Steel Meting Points Up Rapid Progress. Richard B. Shaw. *Journal of Metals*, v. 7, Dec. 1955, p. 1309-1315.

Calculation of the O and Si requirement for the reduction period. Data on the evaluation of curves, and of H and O effects. Tables, graphs. 11 ref.

2338 Process Measurements Lead to Control of Melting Practices. H. H. Johnson and G. A. Fisher. *Journal of Metals*, v. 7, Dec. 1955, p. 1316-1320.

Stresses importance of uniformity of the furnace charges and weighing accuracy; the merit of O for producing the boil; charting the chemistry of steel; C control; furnace operation. Photographs, table. 2 ref.

2339 Factors in Slag Reduction State Detailed for Stainless Melting Practice. D. J. Carney. *Journal of Metals*, v. 7, Dec. 1955, p. 1321-1323.

For optimum recovery of Cr units the chemical, physical, and operational factors must be considered. Photograph. 3 ref.

2340 Deoxidizers and Tapping Temperatures in Stainless Steel Production. Charles Yutmeyer. *Journal of Metals*, v. 7, Dec. 1955, p. 1325-1326.

The major portion of the deoxidation in the arc furnace is accomplished with Si, with ferrotitanium frequently used as a finishing deoxidizer. Recommended bath temperatures are given, dependent upon destination of mold heat. Photograph.

2341 Preparation and Chlorination of Titaniferous Slag From Idaho Ilmenites. Alva H. Roberson and Lloyd H. Banning. *Journal of Metals*, v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 203, Dec. 1955, p. 1335-1342.

A magnesite-lined furnace proved to be more satisfactory for smelting ilmenite in a continuous dry top electric smelting operation than did a C-lined furnace. Photographs, tables, diagram. 3 ref.

2342* Designing of Blast Furnaces on the Basis of Capacity Calculation, and Determination of Economic Coke Requirements. **A nagyolvasztók kapacitásszámításokon alapuló tervezése és a gazdaságos kokszfelhasználás meghatározása.** (Hungarian.) György Szőke. *Kohászati lapok*, v. 10, no. 11, Nov. 1955, p. 481-490.

Concept of production capacity of blast furnaces; determination of its factors. Diagram, tables, graphs.

2343* Recent Trends in Converting. Possibilities for Introducing It Into Hungary. **A szélfrissítés legújabb irányai s hazai bevezetésének lehetőségei.** (Hungarian.) Viktor Zsák. *Kohászati lapok*, v. 10, no. 11, Nov. 1955, p. 490-495.

Critical examination of various processes. Oxygen and pig iron requirements. Tables, graphs, diagram. 8 ref.

2344 Electrolysis of Carbonate Leach Solutions. John C. Huggins. *Merrill Company (U. S. Atomic Energy Commission)*, RMO-2607, July 1952, 23 p.

The results demonstrate the feasibility of a diaphragm cell for recovery by electrolysis of both V and U. Solutions may be derived from the electrolytic operation which are suitable for reuse in a practical cyclic leaching process. Graphs, table.

2345 Continuous Electrolytic Tests. John C. Huggins, Robert A. Carlson, and Irwin F. Schwein. *Merrill Company (U. S. Atomic Energy Commission)*, RMO-2612, Feb. 1954, 17 p. (UF767 U3r)

Results of operation of a four-stage, continuous laboratory electrolytic unit to recover U and V from Monticello Carbonate Leach Solutions. Three runs of 72, 35, and 47 hr. were reported, with recoveries of 76 to 90% of the V and 99% of the U. Diagrams, table.

2346 Preparation of Ores. J. M. McLeod. Paper from METALLURGICAL PROGRESS—2. p. 6-32. 1955. Philosophical Library, New York. (TN705 M56)

Methods of improving blast furnace burdens, sintering of iron ores, theory of sintering and testing materials, and other methods of agglomerating fines and direct smelting processes. 220 ref.

2347 Electric Steel Production. D. D. Howat. Paper from METALLURGICAL PROGRESS—2. p. 33-37. 1955. Philosophical Library, New York. (TN705 M56)

Reviews electric furnace processes; S and H removal. 48 ref.

2348 Non-Metallic Inclusions. H. B. Bell. Paper from METALLURGICAL PROGRESS—2. p. 48-54. 1955. Philosophical Library, New York. (TN705 M56)

Considers solubility of O in Fe and deoxidation by Mn, Si, Al, Ti, Cr, B, V, and Zr. Graph. 48 ref.

2349 Solvent Extraction of Uranium (and Vanadium) From Acid Liquors With Trialkylphosphine Oxides. C. A. Blake, K. B. Brown, and C. F. Coleman. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-1964, Aug. 1955, 106 p. (UF767 U3o)

A number of symmetrical phosphine oxides were prepared and examined systematically for their ability to extract U from acidic nitrate, chloride, sulfate, and phosphate solutions, and mixtures thereof. Most of the compounds tested showed high affinity for U, excellent extractions being obtained from nitrate and chloride solutions, and under the proper conditions from sulfate solutions, including a wide variety of solution in which the structurally similar trialkylphosphates are ineffective. Tables, diagrams, graphs. 37 ref.

2350 The Extraction and Refining of Metals. B. Fullman and F. D. Richardson, editors. Paper from REPORTS ON THE PROGRESS OF APPLIED CHEMISTRY. v. XXXIX. p. 129-161. 1954. Society of Chemical Industry, London. (TP1 So13r)

Survey of advances in inorganic systems and basic physical chemistry. Recent technological advances with the most important metals. 267 ref.

2351* Reduction of Ores by Gases. **Réduction des minerais par les gaz.** (French.) J. Rosier. *Revue de l'institut français du pétrole et Annales des combustibles liquides*, v. 10, no. 9, Sept. 1955, p. 1115-1125.

Reviews processes currently under study using blast furnace technology as a norm. Tables, graph. 20 ref.

2352* Compactness and Oxygen Content of Effervescent Basic Bessemer Steel Ingots. Comparison of Different Formulas of Effervescent Steel. **Compacité et teneur en oxygène des lingots d'acier Thomas effervescent. Comparaison de différentes formules d' acier effervescent.** (French.) A. Delsa. *Revue universelle des mines*, v. 11, ser. 9, no. 10, Oct. 1955, p. 500-508.

Examines influence of temperature, C and Mn additions in the ladle, and Al in ingot molds on the O content of the products. The compactness of sheet bars is studied by torsion tests to determnie the most favorable conditions of production. Tables.

2353* Compactness and Oxygen Content of Effervescent Basic Bessemer Steel Ingots. Study of Different Methods of Deoxidation. **Compacité et teneur en oxygène des lingots d'acier Thomas effervescent. Étude de differents modes de désoxydation.** (French.) F. Classen. *Revue universelle des mines*, v. 11, ser. 9, no. 10, Oct. 1955, p. 509-516.

Influence of anthracite, silico-calcium, and solid and liquid ferromanganese deoxidizing agents on the effervescence and compactness of ingots. Tables, graphs.

2354* Electrolytic High-Grade Purification by Liquid Electrodes. **Elektrolytische Hochreinigung mit flüssigen Elektroden.** (German.) A. Gaumann. *Schweizer Archiv für angewandte Wissenschaft und Technik*, v. 21, no. 10, Oct. 1955, p. 337-342.

Investigates use of liquid electrodes for purification and separation of metals. Process has been applied to ten metals so far. Indium for example, has been obtained with a purity as high as 99.99995%. Graphs, diagrams.

2355* Efficiency Problems of Open-Hearth Furnaces Using Pig Iron and Scrap. **Über die Leistungsprobleme von Siemens-Martin-Öfen beim Roheison-Schrott-Verfahren.** (German.) Wilhelm Schmitt. *Stahl und Eisen*, v. 75, no. 24, Dec. 1, 1955, p. 1627-1640.

Qualitative systematic coordination of the most important variables which affect the output of furnaces. Graphs, tables, flow diagram. 25 ref.

2356* Influence of Reducibility of Self-Fluxing Charge on the Operation of Blast Furnace. **Vliianie vosstanovimosti samoplavkogo aglomerata na rabotu domennoi pechi.** (Russian.) A. M. Bannykh and A. G. Neiasov. *Stal'*, v. 15, no. 11, Nov. 1955, p. 963-968.

Improvement of quality of self-fluxing charge, by increasing its basicity and reducibility, is a factor to be considered in increasing the furnace operating potential. Such a charge promotes the use of high temperature blast. Tables. 4 ref.

2357* Introduction of a Complex Automatic Heat Control System in an Open Hearth Furnace Operating on Crude Oil. **Vnedrenie kompleksnoi sistemy avtoregulirovaniia teplovogo rezhima na mazutnoi martenovskoi pechi.** (Russian.) V. P. Borodin, V. F. Demenkov, P. E. Darmanian, and A. A. Iudson. *Stal'*, v. 15, no. 11, Nov. 1955, p. 977-983.

Description of the system and its components and its advantages in comparison with manual and semiautomatic controls. Tables, graphs, diagrams.

2358* Changes in Nitrogen Content in the Electric Arc Furnace Bath With Different Slag Compositions. **Izmenenie soderzhaniia azota v vanne dugovoi pechi pri shlakakh razlichnogo sostava.** (Russian.) F. P. Edneral. *Stal'*, v. 15, no. 11, Nov. 1955, p. 994-1000.

Proposes ways to decrease N content in electric steels. Tables, graphs, diagrams. 5 ref.

2359 Electric Furnacemen Talk Shop. *Steel*, v. 138, Jan. 9, 1956, p. 64, 66.

Stainless and heat-resisting steel ingot making. Photographs.

2360 Production of Hafnium. H. P. Holmes, M. M. Barr, and H. L. Gilbert. *U. S. Bureau of Mines, Report of Investigations* 5169, Nov. 1955, 33 p. (TN21 Un3r)

With slight modifications, Kroll-process equipment for producing Zr can be used to produce tonnage quantities of Hf. Arc-melted metal can be forged and rolled to sheet. Photographs, diagrams, tables. 13 ref.

2361* How to Attain 7 Million Tons of Steel. **Jakosiagnąć 7 milinnów tonn stali.** (Polish.) Karol Jezierski. *Wiadomości hutnicze*, v. 11, no. 10, Oct. 1955, p. 297-298.

Reference made to Russian experience and an outline of improvements and changes advisable for Polish steel making.

2362* Methods of Closing the Tap-Hole of Open-Hearth Furnaces. **Metody zamykania otworu spustowego pieca martenowskiego.** (Polish.) Władysław Hansel and Wacław Dakowicz. *Wiadomości hutnicze*, v. 11, no. 10, Oct. 1955, p. 299-302.

Advantages and disadvantages of various methods critically analyzed, including "dry", ash, ore, and magnesite methods of closing.

2363* Free Carbon From Coal-Tar Pitches and Its Role in the Preparation of Electrodes and Electrocarbons. **Svobodnyi uglerod kamennougol'nykh pekov i ego rol' v proizvodstve elektrodov i elektrouglei.** (Russian.) V. N. Krylov. *Zhurnal prikladnoi khimii*, v. 28, no. 11, Nov. 1955, p. 1179-1183.

Investigates properties of free C in coal tars and determines its behavior during coking, as well as its role in electrode technology. Table, graph. 6 ref.

2364* Vacuum Method of Eliminating Zinc From Brasses. **Vakuumnyi metod udaleniia tsinka iz latunei.** (Russian.) D. N. Klushin, I. A. Bibina, and K. G. Bogatina. *Zhurnal prikladnoi khimii*, v. 28, no. 11, Nov. 1955, p. 1242-1246.

Relation of degree of dezincification to time and temperature. Method has advantages of operational efficiency and minimum losses of desired metals in the alloy. Diagram, tables, graphs.

See also: **1889** (heating of open-hearth roofs); **2625** (casting defect detection); **2750** (electric furnace fume collection).

METALS—FINISHING, POLISHING, AND CLEANING

2365 Hydrogen Contamination in Descaling and Acid Pickling of Titanium. G. A. Lenning, C. M. Craighead, and R. I. Jaffee. *American Society for Metals, Transactions*, v. 48, *Preprint No.* 33, 1955, 10 p. (TS300 Am35t)

Increased ratio of surface area to mass and increased bath time will cause an increase in H absorption by Ti. In Virgo bath, no H pickup occurred, but surface pitting was evidenced. Tables. 4 ref.

2366 Polishing and Buffing. H. L. Kellner. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 117 + 9 pages. (T13 M56f)

Discusses polishing materials and equipment, burring, brushing, and buffing. Table.

2367 Surface Finishing the Stainless Steels. Lester F. Spencer. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 136 + 7 pages. (T13 M56f)

Basic characteristics and types of stainless steels; commercial mill finishes. Table.

2368 Abrasives and Compounds for Polishing and Buffing. Howard J. McAleer. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 148 + 6 pages. (T13 M56f)

Types of abrasive materials, and buffing compounds and binders.

2369 Abrasive Blasting. Victor F. Stine. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 157-165. (T13 M56f)

Impact blasting is used to replace pickling, electrochemical cleaning, and hand finishing. Methods of and equipment for applying abrasives with air and in liquid are presented.

2370 Barrel Finishing. Peter L. Veit. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 166 + 18 pages. (T13 M56f)

Brief history, terminology, and theory. Discusses selection, conditioning, and the size of media. Barrel-types, design, and maintenance methods are presented. Diagrams.

2371 Solvent Vapor Degreasing. G. W. Walter. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 189-196. (T13 M56f)

Discusses solvents, degreasing apparatus, degreasing cycles, operating methods, maintenance, testing, and ultrasonic degreasing. Diagrams.

2372 Solvent Recovery and Conservation. Max Randall. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 198, 200. (T13 M56f)

Methods for recovering solvents in a degreaser and in a still. Factors to consider in conserving the solvent. Table.

2373 Metal Cleaning. S. Spring. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 200 + 11 pages. (T13 M56f)

Cleaning metals with chemical agents, particularly alkaline, in preparation for electroplating. Micrograpghs, table.

2374 Pickling and Acid Dipping. Nathaniel Hall. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 218-226. (T13 M56f)

Dip and/or pickling formulas for Cd, Fe, steel, Ag, stainless Dip and/or pickling formulas for Cd, Fe, steel, Ag, stainless steel, Ti, and for Al, Cu, Mg, Ni, Zn, and their alloys.

2375 Preparation of Basis Metals for Plating. Nathaniel Hall. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 226-234. (T13 M56f)

Cleaning, dipping, and plating steps for steels, Zn die-castings, Al, stereotypes, slush castings, leaded-brass and -bronze, and Pb.

2376* Plastic or Metallic? How to Choose the Correct Sealant When Impregnating Porous Castings. D. W. Holmes. *Modern Metals*, v. 11, Dec. 1955, p. 54, 56, 58.

Compares three metallic and one plastic impregnation method, giving procedures, cost of equipment and sealant required, and advantages of each method for specific type of porosity. Diagrams, table, photograph.

2377 Liquid Honing as a Surface Conditioning Operation. William C. Ehlert, G. Kauffman, and G. Burrett. *Plating*, v. 42, Dec. 1955, p. 1522-1524.

Equipment, methods, uses, and advantages of liquid abrasive blasting. Photographs, maps.

2378 Consistent Barrel Finishing Assured by File System. *Precision Metal Molding*, v. 14, Jan. 1956, p. 59-61.

A file system which greatly simplifies processing of many different parts in the manufacture of business machines and the versatility required to meet important conditions. Photographs.

2379* Pickling Processes Reviewed. II. Choice of Plant. D. J. Fishlock. *Product Finishing*, v. 8, Dec. 1955, p. 52-68, 104.

Considers the plant and its facilities involved in the processes. Diagrams, graphs, table, photographs. (To be continued.)

2380* Surface Treatment of Aluminum and Its Alloys. **Les traitements de surface de l'aluminium et de ses alliages. I.** Mechanical Treatment. Mechanical Polishing. **Traitements mécaniques. Polissage mécanique.** (French.) Charles Étienne and François Flusin. *Revue de l'aluminium*, v. 32, no. 225, Oct. 1955, p. 921-931.

Reviews buffing and polishing machines, types of polishing, and polishing defects. Table, photographs, diagrams.

2381 Get the Most Out of Vapor Degresaing. Charles E. Kircher and T. J. Kearney. *Steel*, v. 137, Dec. 19, 1955, p. 92-93.

Criteria for selecting proper equipment and solvent for specific applications. Photographs, table.

2382 No Acid in This Pickle Line. *Steel*, v. 137, Dec. 19, 1955, p. 96, 98.

Stainless and heat resisting steels turn bright after special salt bath and atmosphere heating. Working properties are comparable to acid-pickled alloys. Graph, table.

2383* Chemical Polishing of Metals. **Chemické leštění kovů.** (Czech.) V. Dlouhý. *Strojírenství*, v. 5, no. 11, Nov. 1955, p. 837-841.

Advantages in polishing of Cu, Al, and their alloys. Precleaning procedures; regeneration of solutions; determination of degree of polish. Photographs, diagrams. 5 ref.

See also: **2100** (surface treatment for Mg); **2749** (treatment of pickling wastes).

METALS—FOUNDRY PRACTICE

2384 Frozen-Mercury Patterns. Irvin D. Kramer. *Aircraft Production*, v. 17, Dec. 1955, p. 494-497.

Use of frozen mercury for patterns in precision casting offers the advantages of low-volumetric change in melting and a high rate of self-diffusion which gives it the property of self-welding. Quite large investment-castings can be made by using the frozen-Hg process and very complex internal forms, passages and undercuts can be produced. This property makes it possible to eliminate much complex machining and finishing. Photographs, diagrams.

2385 Chevrolet Foundry Has Newest Automatic Equipment. Thomas Mac New. *Automotive Industries*, v. 113, Dec. 15, 1955, p. 50-52.

Describes equipment, layout, and procedures. Among outstanding features are: six Grindle cupolas equipped with capped exhaust systems and automatically controlled by a central, single-board panel operated by one worker; specially designed hangers for overhead conveyors; and new-type fume and dust collecting machinery. Photographs, diagrams.

2386 Huge Increase in Investments Castings for Turbojets. Dean K. Hanink. *Automotive Industries*, v. 114, Jan. 1, 1956, p. 58-59, 112-113.

Investment parts are presently used in the hot end of the gas turbine, primarly as larger structural components. Photographs, graph, flow diagram.

2387* Foundry Practice. William H. Salmon and Eric N. Simons. *Edgar Allen News*, v. 34, Dec. 1955, p. 276-277.

Discusses the salvaging of castings, defects in castings, and heat treatment. Diagram, micrograph. (To be continued.)

2388* Addition by Immersion in Foundry Practice. **Gli iniettori ad immersione in fonderia.** (Italian.) *Fonderia*, v. 4, no. 10, Oct. 1955, p. 477-484.

Description of a method for adding Mg powder to cast iron melts for desulfurization forming 100% nodular cast iron. Tables, diagrams, graphs.

2389* Synthetic Molding Sands in the Foundry. **La terra sintetica in fonderia.** (Italian.) G. C. de Angelis. *Fonderia*, v. 4, no. 11, Nov. 1955, p. 503-515.

Describes sand base; bentonite; and preparation, properties, and characteristics of synthetic molding sand. Photographs, micrographs, diagrams, graphs. 13 ref.

2390* Production of Dense Pieces in Light Alloy. **Fabrication de pièces étanches en alliage léger.** (French.) *Fonderie*, 1955, no. 118, Nov., p. 4786-4787.

Discusses choice of alloy, preparation, molding, inspection, and repair. 2 ref.

2391* Chill Casting of Brass. Preparation of the Alloy. **Le Moulage en coquille du laiton préparation de l'alliage.** (French.) *Fonderie*, 1955, no. 118,, Nov., p. 4788-4789.

Brief discussion of composition of brasses; calculation of zinc addition.

2392 Nomogram for Fairly-Hot Non-Alloyed Iron Cast in Ordinary Dry-Sand Moulds. Sv. Thegel. *Foundry Trade Journal*, v. 99, Dec. 8, 1955, p. 661-670.

An attempt to combine, in one diagram, composition, hardness, and thickness factors for cast iron and their inter-relation with one another, to furnish a method of computing a composition which will provide the properties required in a casting. Graphs, tables. 9 ref.

2393 Modern Patternmaking Establishment. *Foundry Trade Journal*, v. 99, Dec. 8, 1955, p. 675-678.

A description of the new works of Universal Pattern Company (London). Photographs.

2394 Ingates. *Foundry Trade Journal*, v. 99, Dec. 15, 1955, p. 691-702; Dec. 22, 1955, p. 737-742.

Summary of various factors affecting flow through the channels carrying the metal to the casting. Diagrams, photographs, tables. 25 ref.

2395 Gases in Cast Iron. H. Morrogh. *Foundry Trade Journal*, v. 99, Dec. 22, 1955, p. 723-735.

Examination of techniques employed for the determination of gaseous elements in cast iron and for the sampling of cast irons for these determinations. Diagrams, micrographs, photograph, tables. (To be continued.)

2396* Some Aspects on the Use of Strainer Cores and a Draft Standard for Ceramic Strainer Cores. **Synpunkter på användningen av gjutsilar och standardförslag för keramiska gjutsilar.** (Swedish.) G. Fernheden and K. Akesson. *Gjuteriet*, v. 45, no. 11, Nov. 1955, p. 157-164.

The form and dimesions of strainer cores, their ceramic composition, and the design of the gating system are dealt with. A draft standard for eight round and two rectangular ceramic strainer cores with sizes from 1.5 to 8 cm^2 effective areas is presented. Photographs, diagrams, tables. 2 ref.

2397* Grain Refining of Magnesium Alloys. **Zjemňování zrna slitin hořčíku.** (Czech.) Ladislav Kubíček. *Hutnické listy*, v. 10, no. 11, Nov. 1955, p. 651-654.

Effect of additions of Ca or Ca carbonate to alloys of Mg with Mn or Al. Tables, photographs, X-ray patterns. 5 ref.

2398 Continuous Aluminum Melting Furnace Improves Permanent Mold Casting. A. A. Furczyk. *Industrial Heating*, v. 22, Dec. 1955, p. 2486 + 5 pages.

By eliminating wasteful heating of heavy equipment and large reserves of Al, use of an automatic furnace has brought about improved quality of castings, stabilization of production rate, and control of foundry costs. Photographs, micrographs, diagrams.

2399 Down Come Aluminum Casting Costs. W. G. Patton. *Iron Age*, v. 176, Dec. 29, 1955, p. 61-64.

A new casting method process produces castings of a few ounces up to 70 lb. successfully and economically. The castings are accurate, free from porosity, and uniformly finished. Photographs, table.

2400* Diecasting Dies: The Stacking-Unit System. Hiram K. Barton. *Mechanical World and Engineering Record*, v. 135, Dec. 1955, p. 550-552.

A novel type of unit die with greater capacity that is quicker to set up and dismantle. Diagrams. 2 ref.

2401 Moulding Machines. J. B. McIntyre. *Metal Industry*, v. 87, Dec. 9, 1955, p. 483-486.

Classification and characteristics of major types of machines. Diagrams, photographs, table, graph. (To be continued.)

2402 Induction Melting. F. S. Leigh. *Metal Industry*, v. 87, Dec. 16, 1955, p. 503-506.

Explains the differences arising from the application of a mains frequency supply at 50 or 60 cycles for energizing the furnace instead of using a frequency of 500 cycles or over. Diagrams, photographs, graphs.

2403 Moulding Machines. J. B. McIntyre. *Metal Industry*, v. 87, Dec. 16, 1955, p. 506-507.

Description and general survey of the various types of molding machines, and an assessment of the main features of each type. Photographs.

2404* Precision Casting a Competitor of Machining. **Le moulage de précision concurrent de l'usinage.** (French.) K. W. Heimann. *Métallurgie et la construction mécanique*, v. 87, no. 11, Nov. 1955, p. 875 + 5 pages.

A comparative review of the lost wax, Croning, and Shaw processes. Photographs, graph.

2405 We Had To Be Taught How to Use Investment Castings. Carl Benson. *Precision Metal Molding*, v. 14, Jan. 1956, p. 38-40, 79.

Investment casting reduces manufacturing costs and gives the designer a degree of freedom not possible by other manufacturing methods. Photographs.

2406 Vacuum Die Casting . . . A Progress Report. *Precision Metal Molding*, v. 14, Jan. 1956, p. 45-46.

A review of the advantages of a new process by which Zn alloy castings are produced under vacuum. Photographs.

2407 Permanent Mold . . . Casting Process With a Future. *Precision Metal Molding*, v. 14, Jan. 1956, p. 48-51.

Reasons for increased use and advantages of this process. Photographs. 4 ref.

2408 Expendable Pattern Materials for Investment Casting. C. D. Murphy, Jr. *Precision Metal Molding*, v. 14, Jan. 1956, p. 52-54, 82-85, 89-90.

Technical report on properties and characteristics of waxes. Graphs, photographs, tables.

2409* Casting in Permanent Molds Decreases Production Costs. **Odlévání do kokil snižuje výrobní náklady.** (Czech.) Rudolf Koula. *Slévárenství*, v. 3, no. 2, Nov. 1955, p. 341-343.

Advantages of permanent-mold casting. Castings adapted to permanent-mold production. Factors governing choice of type of mold. 4 ref.

2410* Contribution to the Testing of Molding Materials. **Příspěvek ke zkoušení formovacích hmot. I.** Preparation of Test Pieces, Permeability, Strength. **Příprava zkušebních tělísek, prodyšnost, pevnost.** (Czech.) Ladislav Jeníček. *Slévárenství*, v. 3, no. 2, Nov. 1955, p. 343-352.

Compacting and strength tests of molding sands. Ramming tests of small specimens. Photographs, diagrams, graphs, tables. 11 ref.

2411* Production of Cylinders With Cooling Ribs in Shell Molds. **Výroba válců s chladicími žebry ve skořepinových formách.** (Czech.) Rudolf Kloda. *Slévárenství*, v. 3, no. 2, Nov. 1955, p. 352-356.

Methods, equipment, and materials for producing molds and castings. Analyses of causes of defects in castings. Photographs, table, diagram.

2412* Mixtures for the Insulation of Risers. **Směsi pro isolaci nálitků.** (Czech.) Robert Kamenský and Antonín Kubacký. *Slévárenství*, v. 3, no. 2, Nov. 1955, p. 356-359.

A test was devised for measuring the insulating power of various mixtures. Cupola fine dust was found to have good insulating properties. Photographs, tables, graphs. 13 ref.

2413* Moisture and Patterns. **Vlhkost a modely.** (Czech.) Milan Málek. *Slévárenství*, v. 3, no. 2, Nov. 1955, p. 359-362.

Improvement of stability of wood patterns by air conditioning the pattern shops, kiln drying the wood, and/or impregnation, and coating procedures. Graphs, diagrams.

2414 GE Remolds a Foundry. *Steel*, v. 138, Jan. 9, 1956, p. 60-61.

Automation in foundry; casting cycles for large and small castings. Photographs.

2415* Experience With Hot Blast Cupola Furnace in the Foundry. **Erfahrungen mit dem metallurgischen Heisswind-kupolofen in der Giesserei.** (German.) W. Heinrichs and W. Brüker. *Technische Mitteilungen Krupp*, v. 13, no. 6, Oct. 1955, p. 122-132.

Determination of thermal balance; application of recuperator's excess top gases; physical and chemical investigation of properties of pig iron smelted under basic slag; solubility of Fe in relation to H, O, CO, and CO_2; nitrogen gases, and basicity of slag. Graphs, photographs, table, diagram. 11 ref.

See also: **2674** (investment casting).

METALS—HEAT TREATMENT

2416 Shopmade Flame-Hardening Machine Improves Shaft Quality. Patrick J. Bruno. *American Machinist*, v. 99, Dec. 19, 1955, p. 128-129.

Description of machine for treating bars and shafts for machine tools. Photographs.

2417* Selective Surface Hardening. J. L. Harris. *Australasian Engineer*, 1955, Oct. 7, p. 45-52.

Four methods of flame hardening; materials suitable for flame hardening; equipment used; results obtained; costs. Diagrams, graphs, tables, photographs. 7 ref.

2418* Short-Cycle Heat Treatment. Continuous Production Saves Alloys and Time. James Kniveton. *Automation*, v. 3, Jan. 1956, p. 49-52.

Specialized gas furnace design incorporating an instantaneous and efficient control of combustion provides for continuous heat treatment in the manufacture of high-strength pipe. Photographs, diagrams.

2419 Mechanized Batch Type Furnaces. Martin Neumeyer. *Industrial Heating*, v. 22, Dec. 1955, p. 2444 + 11 pages.

Principle advantages of the furnace include: better metallurgical control, flexibility of processing, cost savings in equipment, and portability. Photographs, diagrams, tables.

2420 Ultrasonics: Effects on Steel Heat Treatment. H. V. Fairbanks and F. J. Dewez, Jr. *Iron Age*, v. 176, Dec. 8, 1955, p. 139-142.

Grain refining effect of ultrasonic energy applied to mild steel during heat treatment is important theoretically and commercially, since it tends to modify the classical theory of how crystals can be altered. Commercially, ultrasonics provides a new control technique for many heat treating processes. By increasing diffusion rates, sonic energy might greatly speed carburizing, carbonitriding, nitriding, and chromizing. Micrographs, diagram, graphs.

2421 Induction Heating Speeds Case Hardening. G. B. Kiner. *Iron Age*, v. 176, Dec. 15, 1955, p. 106-107.

Local hardening to a case depth of 0.030 in. is effectively controlled by an induction heating setup. Scanning spray mechanism case hardens long workpieces evenly. Photographs.

2422 Atmosphere Controls Boost Heat Treat Output. T. N. Duncan. *Iron Age*, v. 176, Dec. 22, 1955, p. 76-78.

Batch-type furnaces with automatic atmosphere and temperature controls gives fewer rejects, better control, and doubled production. Diagram, photographs.

2423* Location of Cold Shortness Threshold in Case of Annealing Brittleness. **Polozhenie poroga khladnolomikosti pri otpusknoi khrupkosti.** (Russian.) V. I. Prosvirin and E. I. Kvashnina. *Metallovedenie i obrabotka metallov*, 1955, no. 3, Sept., p. 17-20.

With the origin of annealing brittleness, the threshold of cold shortness is displaced toward higher temperatures. Longer times of high temperature annealing induces a shift of the cold shortness threshold to lower temperatures, but increases grain size. Graphs, micrographs. 4 ref.

2424* Micro-Structure of Cast High Speed Tool Steel. **O mikrostrukture litoi bystrorezhushchei stali.** (Russian.) P. M. Iushkevich and S. A. Fedorova. *Metallovedenie i obrabotka metallov*, 1955, no. 3, Sept., p. 21-25.

Changes in structure during gradual heating up to 1315 C after quenching in water. Formation of tungstide and carbide inclusions. Micrographs. 8 ref.

2425* Rational and Economical Regimes for Annealing Die Blanks of Steel 5KhNT. **Ratsional'nye i ekonomichnye rezhimy otzhiga shtampovykh zagotovok iz stali 5KhNT.** (Russian.) N. A. Timchenko. *Metallovedenie i obrabotka metallov*, 1955, no. 4, Oct., p. 32-38.

Recommended cooling and heating periods in annealing furnaces and their relations to hardness. Kinetics of isothermal austenitic transformation. Cooling conditions of surface and interior zones of blanks. Graphs, tables, micrographs. 2 ref.

2426* Subzero Treatments for Metals. Thomas A. Dickinson. *Metal Treating*, v. 6, Nov.-Dec. 1955, p. 2-4.

Outlines purposes of cold treatment and describes methods now in use. Photographs.

2427* Heat Treating Cold Forgings. Harry A. Kirkpatrick. *Metal Treating*, v. 6, Nov.-Dec. 1955, p. 6-7.

Describes practice at Hycon Manufacturing Co. of Pasadena. Effective use of heat treatment permits cold forging of fin blades for U. S. Navy rockets.

2428* Versatile Carburizing Furnace Pays for Itself in 4 Years. W. H. Weinwurm. *Metal Treating*, v. 6, Nov.-Dec. 1955, p. 8-9.

Used for case hardening over 100 different kinds of industrial sewing machine parts, this single heat-treating furnace is used for producing case depths that vary from .005 to .0400 in. Photographs.

2429* Controlled Atmosphere Instrumentation. R. R. Swain. *Metal Treating*, v. 6, Nov.-Dec. 1955, p. 12, 14.

Discusses use of fuel-air ratio controller, O recorder, and other instruments used in providing uniform prepared atmosphere. Diagrams.

2430 Modern Reheating and Heat-Treatment Furnace Practice. M. W. Thring. *Metal Treatment and Drop Forging*, v. 22, Dec. 1955, p. 507-514.

Problems of the efficient burning of fuels in heating furnaces and their economic operation. Special reference is made to the principles of oil firing, and methods of improving simple heating systems. Diagrams. 13 ref.

2431 Hot-Work Tool Steels. E. Bishop. *Metal Treatment and Drop Forging*, v. 22, Dec. 1955, p. 519-524.

Survey of post-war German developments, and the extensive experimental research in the softening of such steels during long-period holding at various temperatures within the tempering range. Graphs, tables. 5 ref.

2432* On the Mechanism of Boron Hardenability. (English.) Yûnoshin Imai and Hikotarô Imai. *Science Reports of the Research Institutes, Tôhoku University*, ser. A, v. 7, no. 3, June 1955, p. 249-261.

The adsorption of B atoms on an austenite grain surface appears to fill up lattice defects, thus reducing internal strains. Micrographs, tables, graphs. 11 ref.

2433* Dependence of Anisotropy of Mechanical Properties of Steel on the Annealing Temperature. **Zavisimost' anizotropii mekhanicheskikh svoistv stali ot temperatury otpuska.** (Russian.) Shen' Siao Tsin. *Stal'*, v. 15, no. 11, Nov. 1955, p. 1022-1024.

General relationship between the anisotropy of a series of steels and conditions of heat treatment, in particular, the temperature and time of annealing. Tables, graphs. 10 ref.

2434 Heat Treating to Produce Malleable Iron. James H. Lansing. *Steel*, v. 137, Dec. 19, 1955, p. 106-108, 110.

Deals with standard malleable iron from the standpoint of composition, types of furnaces used, and methods of heating and cooling. Micrograph, photographs.

2435 The Metallographic View. XVII. Practical Application of Hardenability. Howard E. Boyer. *Steel Processing*, v. 41, Dec. 1955, p. 774-775.

Accepted methods for determining the hardenability value and its true meaning and the factors which influence it as applied to actual practice. Graphs.

2436 Materials Handling at High Temperature. *Steel Processing*, v. 41, Dec. 1955, p. 793-796.

Diversified heat-treating operations to illustrate how modern high volume heat-treating practice is being mechanized with the aid of high alloy castings. Photographs.

2437* Defects During Heat Treatment in Protective Atmospheres. **Závady při tepelném zpracování v ochranných atmosférách.** (Czech.) J. Domorázek. *Strojírenství*, v. 5, no. 9, Sept. 1955, p. 693-700.

Classification of protective atmospheres, and exothermic and endothermic methods of preparing them. Effects of individual components of atmospheres on steel. Determination of C potential. Cause and elimination of defects. Graphs, diagrams. 8 ref.

2438* Towering Mobile Furnace West's First to Treat 16 Ft. Parts. *Western Metals*, v. 13, Dec. 1955, p. 48-49.

Design and construction of a bottom-loading and quenching mobile furnace with three zone temperature control which will enable both fabrication and heat treatment of many aircraft, oil tool, ordnance, and automotive parts. Photographs.

2439 High Convection Annealing for Wire Coils. James L. Whitten. *Wire and Wire Products*, v. 30, Dec. 1955, p. 1481-1485.

High convection system has made it possible to utilize a great deal more heat by convection transfer to the charges. Method is given for applying this increased fuel input to bell-type annealing furnaces used in the wire industry. Diagrams, photographs, tables.

METALS—MECHANICAL AND PHYSICAL PROPERTIES

2440 On the Effect of Ordering Upon the Strength of Cu_3Au. (English.) G. W. Ardley. *Acta Metallurgica*, v. 3, no. 6, Nov. 1955, p. 525-532.

The room-temperature strength decreases as the degree of long-range order within the anti-phase domains increases, and as these domains grow larger the room-temperature strength first increases and then decreases. Graphs, table. 28 ref.

2441 Some Anelastic Phenomena in Alloys of Gold and Nickel. (English.) Choh-Yi Ang, J. Sivertsen, and C. Wert. *Acta Metallurgica*, v. 3, no. 6, Nov. 1955, p. 558-565.

Two relaxation peaks are found in polycrystalline alloys between room temperature and 600 C. One of these peaks has been identified as the order peak; the origin of the other is uncertain. Diagram, graphs, micrographs, tables. 14 ref.

2442 The Heats of Formation of Some Transition Metal Silicides. (English.) D. A. Robins and I. Jenkins. *Acta Metallurgica*, v. 3, no. 6, Nov. 1955, p. 598-604.

Data obtained show that the lower silicides are in most cases more stable than the disilicides, and that the highest heats of formation are to be found in Group IVa. Diagram, tables. 13 ref.

2443* Fatigue Resistance Test FR of Light Alloys. Influence of Experimental Factors. **La prova di fatica a flessione rotante delle leghe leggere. Influenza dei fattori sperimentali.** (Italian.) G. Panseri and F. Gatto. *Alluminio*, v. 24, no. 5, Sept.-Oct. 1955, p. 447-458.

Results of a series of tests for the determination of the influence of shape, size, and superficial finishing of specimens on the results of fatigue resistance tests. Tables, diagrams, micrographs, graphs. 11 ref.

2444* Researches Concerning the Anisotropy of the Resistance to Fatigue of Ergal 65 TA Alloy. **Ricerche sperimentali sull'anisotropia della resistenza a fatica della lega Ergal 65 TA.** (Italian.) C. Panseri and F. Gatto. *Alluminio*, v. 24, no. 5, Sept.-Oct. 1955, p. 459-463.

Dispersion of test results prevented comparisons between specimens. Causes of the variations could not be identified. Tables, diagrams, graphs. 8 ref.

2445* Treatment of Light-Alloy E AlMgSi. **Die Behandlung der Leitlegierung E AlMgSi.** (German.) E. Nachtigall and H. Landerl. *Aluminium Ranshofen, Mitteilungen*, v. 3,: no. 2, Oct. 1955, p. 40-43.

Mechanical and physical properties of light wire; soft and liquid annealing; cold and hot age hardening. Graphs.

2446 Quantitative Determination of Rolling and Recrystallization Textures in 600°C- and 300°C-Rolled Uranium Rods. Warren P. Chernock and Paul A. Beck. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, AECD-3663, Aug. 1951, 38 p. (UF767 Un3m)

Rolling textures consist of two fiber texture components in which the (010) and the (110) planes are perpendicular to the rod axis. Recrystallization texture of a rod having a (010) rolling texture consists of the (010) and the (140) fiber texture components. Diagrams, graphs, photographs. 19 ref.

2447 Thermal Cycling Equipment. R. M. Mayfield and S. T. Zegler. *Argonne National Laboratory, Metallurgy Division (U. S. Atomic Energy Commission)*, ANL-4848, Nov. 1951, 26 p. (UF767 Un3.1an)

Design and construction of an induction cycling unit, a vertical tube unit (Woosher), and a low-temperature unit (Wig Wag), built at Argonne National Laboratory for studying effect of thermal cycling on the dimensional stability of U. Photographs, diagrams, graphs.

2448 Hydrogen in Mild-Steel Weld Deposits. N. Christensen and R. Rose. *British Welding Journal*, v. 2, Dec. 1955, p. 550-558.

Formation of internal microcracks was studied in single-run deposits from 11 brands of Continental electrodes. Preliminary experiments are reported illustrating a new method that was suggested for the study of cracking under controlled cooling rates. The resemblance between fish-eyes and brittle spots due to H cracks is considered. Diagrams, micrographs, tables. 17 ref.

2449* Study of the Electrical Anisotropy of Gallium in the Vicinity of the Melting Point. **Sur l'étude de l'anisotropie électrique du gallium au voisinage du point de fusion.** (French.) Israel Epelboin and Marc Enry. *Comptes rendus*, v. 241, no. 17, Oct. 24, 1955, p. 1118-1121.

Variation of the electrical resistivity of the monocrystals as a function of temperature. Graph. 5 ref.

2450* Solubility Differences of Atomic and Molecular Hydrogen in Columbium. **Sur la différence des solubilités dans le niobium, de l'hydrogène a l'état atomique ou moléculaire.** (French.) Vladimir M. Vukanović, Vukica M. Milutinović, and Stjepan S. Malcić. *Comptes rendus*, v. 241, no. 19, Nov. 7, 1955, p. 1298-1299.

By X-ray diffraction it is shown that at. H solubility is higher than that of H in the molecular state.

2451* Variation of Viscosity of Metallic Wires With Temperature. **Variation avec la température de la viscosité des fils métalliques.** (French.) Constantin Sălceanu. *Comptes rendus*, v. 241, no. 20, Nov. 14, 1955, p. 1384-1386.

Study of the effect of temperature on the viscosity of iron wire, working with a moment of inertia of 970 g. per sq. cm. Table. 4 ref.

2452* Lowering the Apparent Limit of Elasticity of Steels by Creep After Beginning of Cold Working at Ordinary Temperature. **Abaissement de la limite apparente d'élasticité des aciers par fluage après une amorce d'écrouissage (à température prdinaire).** (French.) Ferdinand Campus and Kasimierz Gamski. *Comptes rendus*, v. 241, no. 22, Nov. 28, 1955, p. 1552-1554.

Study of C-Mn-Si and C-Mn steels subjected to drawing. 1 ref.

2453* Viscosity and Internal Friction in Metallic Wires. **Viscosité et frottement intérieur dans les fils métalliques.** (French.) Constantin Sălceanu. *Comptes rendus*, v. 241, no. 22, Nov. 28, 1955, p. 1554-1555.

Measurement determination in steel and Al wires. 3 ref.

2454* Effect of Small Addition on Galvanomagnetic Properties of Bismuth. **Vliianie malykh primesei na gal'vanomagnitnye svoistva vismuta.** (Russian.) N. E. Alekseevskii, N. B. Brandt, and T. I. Kostina. *Doklady akademii nauk SSSR*, v. 105, no. 1, Nov. 1, 1955, p. 46-49.

Effect of pressure up to 1750 atmospheres on properties of Bi with various contents of Sn and Te. Graphs. 8 ref.

2455* Nature of Electric Conductivity Change in Case of Staggered Deformation of Metal-Monocrystals. **O kharaktere izmeneniia elektroprovoduosti pri skachkoobraznoi deformatsii metallicheskikh monokristallov.** (Russian.) V. N. Rozhanskii, Iu. V. Goriunov, and O. D. Shchukin. *Doklady akademii nauk SSSR*, v. 105, no. 1, Nov. 1, 1955, p. 80-82.

Study of electric conductivity changes in Zn of 99.99% purity during deformation. Diagram, graph. 4 ref.

2456* Certain Phenomena Observed in the Electron Microscope on a Tungsten Mono-Crystal Surface in the Presence of Gases. **O nekotorykh iavleniiakh, nabliudaemykh na poverkhnosti vol'framovogo monokristalla v elektronnom mikroskope-proektore v prisutstvii gazov.** (Russian.) S. Z. Roginskii and I. I. Tret'iakov. *Doklady akademii nauk SSSR*, v. 105, no. 1, Nov. 1, 1955, p. 112-114.

Study of adsorbed molecules on W single crystals under a vacuum. Diagram, micrographs. 4 ref.

2457* Zero-Charge Potentials of Copper and Chromium. **O potentsialskh nulevykh zariadov medi i khroma.** (Russian.) E. A. Ukshe and A. I. Levin. *Doklady akademii nauk SSSR*, v. 105, no. 1, Nov. 1, 1955, p. 119-122.

Describes method of measuring potentials by means of bubble position on the electrode. Graphs, photographs. 12 ref.

2458* Determination of the Elastic Constants of Metallic Materials by Sound Propagation Measurements. **La determinacion de las constantes elasticas de los materiales metalicos por medio de medidas de propagacion del sonide.** (Spanish.) H. J. Seemann. *Instituto del hierro y del acero*, v. 8, no. 38, July-Sept. 1955, p. 398-405.

Presents methods and calculations for above. Graphs, oscillograms, diagrams. 14 ref.

2459* **Instrumentation in Crystal Mechanics.** A. J. Kennedy. *Instrument Practice*, v. 9, Nov. 1955, p. 1052-1056.

The basic mechanical problem geometric and profile devices, and the use of an electrical extensometer are discussed. The special problems are summarized. Diagrams. 11 ref.

2460 Thermodynamics of C in Iron Alloys. I. Solubility of C in Fe-P, Fe-Si and Fe-Mn Melts. II. Influence of Silicon on Activity Coefficient of Carbon Dissolved in Molten Iron. III. Solubility of Carbon in Fe-S Melts. IV. Solubility of Carbon in Fe-Si-P Melts. E. T. Turkdogan, L. E. Leake, and R. A. Hancock. *Iron & Steel*, v. 28, Nov. 30, 1955, p. 567-574.

Includes tables, diagram, graphs.

2461* Studies on Mechanical Properties of 19-9 D L. (Japanese.) Taro Hasegawa, Osamu Ochiai, and Junich Ino. *Iron & Steel Institute of Japan, Journal*, v. 41, no. 10, Oct. 1955, p. 1112-1118.

Effect of Nb is distinct at longer time or higher temperature of testing and at "hot cold working" rather than in age-hardened state. Tables, graphs, micrographs. 2 ref.

2462 Dynamic Determination of the Compressibility of Metals. Roy W. Goranson, Dennison Bancroft, Blendin L. Burton, Theodore Blechar, Edwin E. Houston, Elisabeth F. Gittings, and Stanley A. Landeen. *Journal of Applied Physics*, v. 26, Dec. 1955, p. 1472-1479.

A theory is presented which allows comparison with data obtained by other experimenters, and which yields the relationship between pressure and compression either at constant entropy or constant temperature. Diagrams, tables, graphs. 1 ref.

2463 Total Emissivities and Absorptivities of Some Commercial Surfaces at Room and Liquid-Nitrogen Temperatures. F. J. Zimmermann. *Journal of Applied Physics*, v. 26, Dec. 1955, p. 1483-1488.

Determination of design values for the emissivities and absorptivities of surfaces that could be obtained commercially on reasonably large equipment. Diagrams, tables, graphs.

2464 Heat Capacity of Erbium From 15 to 320°K. R. E. Skochdopole, Maurice Griffel, and F. H. Spedding. *Journal of Chemical Physics*, v. 23, Dec. 1955, p. 2258-2263.

Thermodynamic functions were calculated and three maxima observed which occur at 19.9, 53.5, and 84 K. A correlation of the various contributions to the entropy at room temperature was made and extended to the other rare earth metals. Tables, graphs. 19 ref.

2465* Endurance Strength of Copper and Some Copper Alloys. **Dlitel'naia prochnost' medi i nekotorykh mednykh splavov.** (Russian.) A. P. Simakovskii. *Metallovedenie i obrabotka metallov*, 1955, no. 3, Sept., p. 32-38.

Chemical composition and mechanical properties with different temperatures and treatment. Tables, graphs.

2466* Hardness of Surface Diffusion Layers at High Temperatures. **Tverdost' poverkhnostnykh diffuzionnykh sloev pri povyshennykh temperaturakh.** (Russian.) G. F. Beliaeva and M. G. Lozinskii. *Metallovedenie i obrabotka metallov*, 1955, no. 3, Sept., p. 54-57.

Determination of surface hardness at temperatures up to 1100 C in vacuum. This method permits the determination of the character of diffusion layers in the range of operating temperatures. Graphs, micrographs. 8 ref.

2467* Effect of Tempering on the Hardness of a Surface Layer Hardened by the Electrospark Method. **Vliianie otpuska na tverdost' poverkhnostnogo slois, uprochnennogo elektroiskrovym sposobom.** (Russian.) G. P. Ivanov, V. A. Belianin, and V. V. Borisova. *Metallovedenie i obrabotka metallov*, 1955, no. 4, Oct., p. 48-51.

Effect of electrode material (Cr, W, ferro-chromium) and tempering temperature on properties of the hardened layer. Graphs, table. 5 ref.

2468* **Creep of High-Purity Nickel.** *National Bureau of Standards, Technical News Bulletin*, v. 39, Dec. 1955, p. 162-164.

Precise data on creep in the first two stages. Micrographs, graphs. 2 ref.

2469 Effect of Shape Anisotropy on the Coercive Force of Elongated Single-Magnetic-Domain Iron Particles. T. O. Paine, L. I. Mendelsohn, and F. E. Luborsky. *Physical Review*, v. 100, ser. 2, Nov. 15, 1955, p. 1055-1059.

Particles, 150 A. in diameter, have been prepared with properties that definitely confirm the existence of a shape anisotropy effect on coercive force. Micrographs, diagrams. 31 ref.

2470 An Approach to Elongated Fine-Particle Magnets. I. S. Jacobs and C. P. Bean. *Physical Review*, v. 100, ser. 2, Nov. 15, 1955, p. 1060-1067.

Coercive force predicted by theory for single-domain particles with shape anisotropy frequently far exceeds the observed value. Several approximate models are suggested which may exist in certain experimental situations. Detailed calculations are presented for a "chain-of-spheres" model remagnetizing by several mechanisms. Diagrams, tables, graphs. 22 ref.

2471* Residual Magnetization and Magnetostriction of Nickel Single Crystals. (English.) Yoji Nakamura. *Physical Society of Japan, Journal*, v. 10, no. 11, Nov. 1955, p. 937-941.

By use of long cylindrical single crystals of pure Ni with various crystallographic orientations, magnetization and magnetostriction were measured at room temperature. Magnetostriction curves constructed theoretically from the obtained values of magnetostriction constants agree with the experimental curves. Diagrams, tables. 12 ref.

2472 The Thermoelectric Power of Monovalent Metals. H. Jones. *Physical Society, Proceedings*, v. 68, no. 432A, Dec. 1955, p. 1191-1193.

The thermoelectric power of the noble metals is very sensitive to the form of the Fermi surface, and therefore is not necessary to have the conditions usually associated with "hole conduction" to obtain a positive value. Diagrams. 2 ref.

2473 Some Electrical Effects of the Adsorption of Water Vapour by Anodized Aluminium. A. C. Jason and J. L. Wood. *Physical Society, Proceedings*, v. 68, no. 432B, Dec. 1955, p. 1105-1116.

The resistance and capacity of porous anodized Al oxide layers are related to the adsorption of water on the surface of the pores. Diagrams, graphs, tables. 14 ref.

2474* On the Theory of Thermal Conductivity of Monovalent Metals. Tadao Kasuya. *Progress of Theoretical Physics*, v. 13, June 1955, p. 561-570.

Mathematical analysis and discussion of theories. Graphs. 8 ref.

2475* Description of an Universal Apparatus for Elastic Damping of Metals. Applications to Aluminum. **Un appareil universel pour la détermination de l'amortissement élastique des métaux. Applications à l'aluminium.** (French.) H. J. Seemann. *Revue de métallurgie*, v. 52, no. 11, Nov. 1955, p. 864-868.

Equipment to gage elastic damping capacity of metals over a spread of frequency, temperature, and deformation amplitude is applied to 99.997% Al. Graphs, diagrams. 6 ref.

2476* Study of the Mechanical Relaxation of Residual Welding Stresses During Static Stress and Fatigue. **Etude de la relaxation mechanique des tensions residuelles de soudage en sollicitation statique et en fatigue.** (French.) F. Hebrant, H. Louis, W. Soete, and A. Vinckier. *Revue de la soudure (Brussels)*, v. 11, no. 3, 1955, p. 139-151.

Research on the influence of residual stresses on the possible behavior of a welded object. Diagrams, tables, graphs, photographs.

2477* Methods of Fracture as a Function of the Stress State and Temperature. **Modes de rupture en fonction de l'état de tension et de la température.** (French.) F. Hebrant, H. Louis, W. Soete, and A. Vinckier. *Revue de la soudure (Brussels)*, v. 11, no. 3, 1955, p. 152-173.

Research on the fracture of typical welded assemblies from design considerations. Factors influencing brittle fracture. Graphs, photographs, tables, diagrams.

2478* Torsion Test, Method of Inspecting Flat Pieces of Effervescent Steel. **L'essai de torsadage, méthode de controle des produits plats en acier effervescent.** (French.) J. Nils. *Revue universelle des mines*, v. 11, ser. 9, no. 10, Oct. 1955, p. 499-500.

Describes a test for the economic evaluation of the compactness of effervescent steel ingots. Diagram.

2479 Effects of Temperature on the Plastic Properties of Aluminum Crystals. A. H. Cottrell and R. J. Stokes. *Royal Society, Proceedings*, v. 233, ser. A, Dec. 6, 1955, p. 17-34 + 2 plates.

By changing the temperature of deformation, during tensile experiments on single crystals, it is possible to separate reversible changes of flow stress with temperature from irreversible ones. It is proposed that, under the combined influence of stress and temperature, sessile dislocations at the heads of piled-up groups of dislocations become unlocked; the piled-up groups then partly collapse and many dislocations are released for slip. The reversible changes of flow stress are interpreted in terms of the intersection of dislocation lines. Tables, graphs, photographs. 3 ref.

2480 The Specific Heats of Potassium, Rubidium and Caesium at Temperatures Below 330° K. T. M. Dauphinee, Douglas L. Martin, and H. Preston-Thomas. *Royal Society, Proceedings*, v. 233, ser. A, Dec. 20, 1955, p. 214-222.

Anomalies were found in the specific heats of all these metals. The anomaly in Rb is found to be affected by heat treatment of the sample. The Cs measurements give direct calorimetric information relating to the Cs-O binary system. Graphs, tables. 14 ref.

2481 On the Plastic Flow of Metals Under Conditions of Axial Symmetry. R. T. Shield. *Royal Society, Proceedings*, v. 233, ser. A, Dec. 20, 1955, p. 267-287.

Axially symmetric plastic flow of a rigid-plastic non-hardening material which obeys the Tresca yield criterion of constant maximum shearing stress and the associate flow rule. Diagrams, graphs, tables. 17 ref.

2482* A Theory of the Uniaxial Ferromagnetic Anisotropy Induced by Magnetic Annealing in Cubic Solid Solutions. (English.) Satoshi Taniguchi. *Science Reports of the Research Institutes, Tôhoku University*, ser. A, v. 7, no. 3, June 1955, p. 269-281.

A solid solution may yield an anisotropic equilibrium distribution of solute atom pairs at temperatures below the Curie temperature. This may cause an additional ferromagnetic anisotropy having a lower-than-cubic symmetry. Results obtained from calculating uniaxial ferromagnetic anisotropy induced by magnetic annealing agree with available experimental data. Graphs, tables. 21 ref.

2483* Fatigue of Aircraft. P. L. Teed. *Shell Aviation News*, 1955, no. 208, Oct., p. 14-21.

History of the evolution of aerodynamics. Data on the stresses imposed on an aircraft and effects of built-in stresses. Photograph, diagrams, tables, graphs.

2484* Mechanical Properties of Large Forged Pieces. **Mekhanicheskie svoistva krupnykh pokovok.** (Russian.) A. N. Zhironkin, A. D. Men'shikov, and P. D. Khinskii. *Stal'*, v. 15, no. 11, Nov. 1955, p. 1016-1022.

Heat treated cross sections of large pieces (700 mm. in diameter) showed marked increase of nonuniformity in properties of metal which is explained by increased H concentration in the deeper layers of the piece. Tables, graphs, diagrams.

2485 Choice of Materials for Parts Subject to Abrasive Wear. **Volbe materiálů pro součásti, podléhající abrasivnímu opotřebení.** (Czech.) J. Shon. *Strojírenství*, v. 5, no. 7, July 1955, p. 525-529.

Influence of impact stress on choice of materials; of alloys to increase abrasion resistance. Properties of Mn steel. Hard-facing as an economical substitute for alloying. Tables.

2486* Calculation of Strength of Machine Parts Subject to Fatigue Stresses. **Výpočet pevnosti strojních součástí namáhaných v únave.** (Czech.) F. Budinský and Vl. Jirásek. *Strojírenství*, v. 5 ,no. 8, Aug. 1955, p. 587-588 + 4 page suppl.

Two problems which demonstrate the use of the supplementary tables in testing axles and shafts by bending and torsion. Effect of notch sensitivity on fatigue limit. Tables, graphs.

2487* Testing of Ferritic Steels at Low Temperatures. **Zkoušení ferritických ocelí za nižších teplot.** (Czech.) Jar. Kermes. *Strojírenství*, v. 5, no. 8, Aug. 1955, p. 598-605.

Effect of low temperatures on the operational reliability of parts subject to dynamic stress and reasons for brittleness resulting at such temperatures. Effect of various factors on critical temperature and of heat treatment and chemical composition. Tables, graphs, micrograph, photograph. 11 ref.

2488* Statistical Theory of the Fatigue of Material. **Statistická teorie únavy materiálu.** (Czech.) J. Sedláček. *Strojírenství*, v. 5, no. 11, Nov. 1955, p. 859-863.

Determination of slope, shape, and other parameters of curves graphically and analytically. Graphs, table. 9 ref.

2489 Longitudinal Deformation of Long Beam Due to Fillet Welding. Tokutanō Sasayama, Kōichi Masubuchi, and Sigeru Moriguchi. *Welding Journal*, v. 34, Dec. 1955, p. 581S-582S.

Effects of joint dimension, wt. of deposited metal, and other welding procedures on deformation. Diagrams, table, graphs.

2490 Studies on the Brittle Failure of Tankage Steel Plates. F. J. Feely, Jr., M. S. Northup, S. R. Kleppe, and M. Gensamer. *Welding Journal*, v. 34, Dec. 1955, p. 596S-607S.

Studies progress of fracture under conditions similar to those in real structures, and correlates results with values obtained from conventional tests. Diagrams, graphs, tables. 14 ref.

2491 Tensile Properties of Zirconium and Zirconium Alloys. I. Zirconium and Alloys With Oxygen, Columbium, Tin, Copper, Vanadium, Tungsten, and Tantalum. C. R. Simcoe and W. L. Mudge, Jr. *Westinghouse Electric Corporation (U. S. Atomic Energy Commission)*, AECD 3680, Nov. 1951, 70 p. (UF767 Un3m)

Tensile properties of rolled and annealed sheets, in the range from room temperature to 750 F, were determined as a function of temperature. Yield and tensile strengths are lower than those previously reported. Graphs, micrographs, photographs, tables, diagram. 1 ref.

2492* The Magnetic Behavior of Electrolytic Chromium. **Über das magnetische Verhalten von Elektrolytchrom.** (German.) R. Lingelbach. *Zeitschrift für physikalische Chemie (Frankfurt)*, v. 5, nos. 5-6, Nov. 1955, p. 273-283.

Susceptibility measurement of tempered and non-tempered electrolytic Cr between 66 and 293 K. Graphs. 22 ref.

2493* Connection Between the Potential of Zero Charge and Physical-Chemical Characteristics of Metals. **O sviazi mezhdu potentsialom nulevoga zariada i fiziko-khimicheskinii kharakteristikami metallov.** (Russian.) V. M. Novakovskii, E. A. Ukshe, and A. I. Levin. *Zhurnal fizicheskoi khimii*, v. 24, no. 10, Oct. 1955, p. 1847-1853.

On the basis of contemporary theory of electrode potential, equations are derived which relate the potential of zero charge with other physical-chemical characteristics. Tables. 13 ref.

See also: **2577** (effect of stresses on aging).

METALS—MECHANICAL WORKING

2494 Machining Thin Sections. *Aircraft Production*, v. 17, Dec. 1955, p. 472-476.

Machining large-diameter thin-section parts of less than 0.20 in. in thickness presents a number of difficulties. Of these, the gradual build-up of vibration by resonance and deformation of the part by spinning-over of the material are the most important. The most successful approach as yet employed for this class of operation is the balanced-cut double-sided turning technique, where the tools are traversed across the surfaces simultaneously. Photographs, diagrams.

2495 Close-Tolerance Forgings. George W. Motherwell. *Aircraft Production*, v. 17, Dec. 1955, p. 478-481.

Discusses progress in the improvement of accuracy and the reduction of machining. Some of the problems of producing forgings with small draft angles and to close tolerances are discussed and some specific examples are illustrated of work already done. Photographs, diagram.

2496 How to Design Die Blocks. J. R. Paquin. *American Machinist*, v. 100, Jan. 2, 1956, p. 88-93.

Eighteen illustrated methods for applying die blocks to small, medium, and large cutting dies. Tables, diagrams. (To be continued.)

2497 Finish vs Tool Rake. Max J. Kuderko and Claude A. Potter. *American Machinist*, v. 100, Jan. 2, 1956, p. 115, 117, 119.

Positive rake toolholder is useful for machining soft materials and is helpful to shops using older machines unable to take required cuts with negative rake tool-holders. Micrographs, photographs, table.

2498* **Automation Applied to Sheet Metal Blanking.** Joseph F. Lyden. *Automation*, v. 3, Jan. 1956, p. 34-37.

An economic comparison case study using coil stock as opposed to cut sheet stock. Diagrams, photographs, tables.

2499 Ultrasonic Machining of Brittle Materials. Maurice S. Hartley. *Electronics*, v. 29, Jan. 1956, p. 132-135.

Slicing Ge, Si, quartz, ferrites, glass-bonded mica, and other material at high speed by impact grinding results in greater precision and makes possible a great variety of shapes. Photographs, diagrams, table.

2500 Aluminium Extrusion Factory Production Plant Housed in the Product. *Engineering*, v. 180, Dec. 9, 1955, p. 799-801.

Describes new British plant, roofed and walled in Al, which houses two large extrusion presses, as well as a variety of auxiliary equipment for heat treatment, straightening, and other purposes. Photographs.

2501 Hot-Rolled Gear Wheels. A. D. Kuzmin, M. V. Vasilchikov, and M. V. Barbarich. *Engineers' Digest*, v. 16, Dec. 1955, p. 575-577. (Translated from *Vestnik Mashinostroyenya*, v. 35, no. 3, Mar. 1955, p. 53-56; no. 9, Sept. 1955, p. 41-44.)

Production process for the hot-rolling of gears with a quality entirely satisfactory for engineering purposes. Diagrams, graph.

2502* New Measuring Appartuses in Rolling Mills. **Nový přístroj registrujíci nastavení válců.** (Czech.) Adolf Unčovský. *Hutnické listy*, v. 10, no. 11, Nov. 1955, p. 676-678.

Description of instruments for distance indication of the roll adjustment of the housing, automatic cutting control of pneumatic shearing, and registration of the rolling pass plan. Photographs, diagrams. 4 ref.

2503 Abrasive Belt Grinding of Metals. Hugh N. Dyer. *Industrial and Engineering Chemistry*, v. 47, Dec. 1955, p. 2500-2505.

Some tests on both laboratory and commercial grinding equipment are reported which show how metal removal and belt wear vary with different grinding conditions and with different metals. Photographs, graphs. 6 ref.

2504 Tendencies Revealed by Studying the Transformation of Basic Bessemer Steel Ingots BTM Prepared With Oxygen-Enriched Air. **Tendances dégagées par l'étude de la transformation de lingots d'acier Thomas BTM élaboré au moyen d'air enrichi en oxygène.** (French.) P. Leroy and J. Strems doerfer. *Institut de recherches de la sidérurgie, publications*, ser. A, no. 105, July 1955, 35 p. (TN602 In7p)

Discusses transformation into thin sheets for swaging, transformation into wire, and conclusions on the mechanical properties of basic Bessemer steel BTM resulting from this study. Tables, micrographs, graphs.

2505* **Automatic Size Control.** F. R. Boosey. *Instrument Practice*, v. 9, Nov. 1955, p. 1067-1069.

Circuits and description of their functions in machine tool grinding operations. Diagrams.

2506 How to Choose the Right Broaching Fixture. Harry Gotberg. *Iron Age*, v. 176, Dec. 8, 1955, p. 135-138.

Choice of work-holding fixture to be used depends on the part itself, production required, and machining operations. Discusses most widely used designs of indexing fixtures, shuttles, and trunnion devices, with examples of jobs they do best. Photographs.

2507 Precision Dies Stamp Difficult Contoured Part. *Iron Age*, v. 176, Dec. 8, 1955, p. 148-149.

A 1½-ton punch insert machined to exact contours, is used to form an intricate sheet steel wheel 5 ft. in diameter. Surface at completion of drawing operations is scratch-free and smooth, eliminating the need for further finishing. Manufacturing costs are 80% lower than the original cost of spinning the part.

2508 Special Planer Mills Intricate One-Ton Castings. *Iron Age*, v. 176, Dec. 15, 1955, p. 98-99.

Large castings are rough and finish machined in a multiple series of operations. Two coordinated horizontal milling heads work with two vertical heads to minimize production costs. Photographs.

2509 Rolling, Forging Facilities Meet Diversified Needs. R. C. Humphrey. *Iron Age*, v. 176, Dec. 15, 1955, p. 103-105.

Facilities at Westinghouse's new plant are adaptable and multi-purpose. Facilities permit a wide range of developmental and production work. Photographs.

2510 Ceramic Insulation Reduces Roll Maintenance. *Iron Age*, v. 176, Dec. 15, 1955, p. 110.

Roll sleeves, packed with long life ceramic fiber insulation, hold high alloy sheets at rolling temperature from furnace to two-high mill. Sleeves spin up to 300 r.p.m. Photograph.

2511 So You're Going to Buy a Press? M. D. Verson. *Iron Age*, v. 176, Dec. 22, 1955, p. 71-73.

Tips on hydraulic and mechanical presses, rated capacities, speeds, adjustment and safety features, and lubrication systems.

2512 Screw Machine Attachment Rolls Accurate Threads. W. G. Patton. *Iron Age*, v. 176, Dec. 22, 1955, p. 74-75.

A new type of thread rolling attachment on six-station automatice bar machines aids rocker arm valve stud production and assures accuracy of threads within 0.0005 in. Diagrams, photograph.

2513 Water-Lubricated Wood Rolls Bevel Aluminum. A. F. Schub. *Iron Age*, v. 176, Dec. 29, 1955, p. 68-69.

The conventional design advantages, cost factor, and speed of a home-grown, two-stand machine are discussed. It replaces ten-stand equipment on short production runs. Photographs.

2514 High Speed Rod Rolling at Continental Steel Corp. Don C. Horsman. *Iron and Steel Engineer*, v. 32, Dec. 1955, p. 53-59; disc., p. 59-61.

Production gain is accomplished through multi-strand rolling, high speeds, and larger bundles. Equipment and methods are described in detail. Photographs.

2515 Specialty Rolling Mills Have Versatile Control. A. J. Winchester and D. E. Abell. *Iron and Steel Engineer*, v. 32, Dec. 1955, p. 144, 147, 148, 150.

Design and construction details of a reversing hot mill and a reversible cold mill with unique control equipment. Photographs, diagram.

2516* On the Shot for Peening. II. (Japanese.) Michira Uchiyama and Kazunori Kamishohara. *Iron & Steel Institute of Japan, Journal*, v. 41, no. 10, Oct. 1955, p. 1093-1097.

Effect of shot size, hardness and speed on the coverage, peening intensity, and surafce roughness of the work. Graphs. 5 ref.

2517 Ingot Heat Conservation. The Cooling of Rimming-Steel Ingots Between Teeming and Stripping. M. D. Ashton, R. F. Perkins, and L. H. W. Savage. *Iron and Steel Institute, Journal*, v. 181, Dec. 1955, p. 303-312.

Method for reducing fuel consumption in soaking pits, increasing pit availability, and increasing mold life by stripping all ingots at earliest practical time. Graphs, diagrams, photographs, tables. 10 ref.

2518 Production of Turbine Compressor Blades by Forging. *Light Metals*, v. 18, Dec. 1955, p. 414-415.

Process for forging Ti blades, for the axial compressor of a prototype gas turbine; eliminates galling. Diagrams, photographs.

2519 Glass Lubricant in the Extrusion of Steel. J. Sejournet and J. Delcroix. *Lubrication Engineering*, v. 11, Nov.-Dec. 1955, p. 389-396.

Molten glass is the lubricant in the Ugine-Sejournet process for extruding steel under conditions of high temperature and pressure and facilitates the flow of the metal being deformed. Discusses the special conditions under which glass acts as a lubricant, and describes the very special requirements of this application and the responsive properties of glass in this use. Diagrams, photographs, graphs.

2520 Fluids for the Grinding of Titanium. E. J. Krabacher. *Lubrication Engineering*, v. 11, Nov.-Dec. 1955, p. 397-401.

Development of a fluid based on sound metal-cutting principles. A glass-streak test was used for screening, since potentially useful grinding fluids prevent wetting of glass by Ti. Micrographs, graphs, tables.

2521 Production of Gas Turbine Blades by Precision Forging. E. B. Wells. *Machinery (London)*, v. 87, Dec. 2, 1955, p. 1292-1297.

Describes furnaces, other equipment, and methods used. Photographs.

2522 Coined and Embossed Sheet Metals. Malcolm W. Riley. *Materials & Methods*, v. 42, Dec. 1955, p. 94-97.

Discusses advantages, mechanical properties, fabrication and design, finishes, costs, and applications. Graphs, tables, micrographs, photographs.

2523 Extruded Aluminium. *Metal Industry*, v. 87, Dec. 2, 1955, p. 463-465.

Describes plant and practice at Latchford Works of British Aluminium Company Ltd. Photographs.

2524* Shot Peening for Safety. *Modern Metals*, v. 11, Dec. 1955, p. 52.

Special methods developed to improve fatigue strength of stress areas in propellers, hub assemblies, and other aircraft parts. Photograph.

2525 Recommended Practices for Uranium Finishing. William B. Harris. *New York Operations Office (U. S. Atomic Energy Commission)*, NYO-1516, May 1955, 13 p. (UF767 U3ny)

Specific machining practices, consistent with the maintenance of acceptable levels of airborne U, include the various tools for each type of machining job with recommended tool speeds, coolant flows, and ventilation requirements. Diagram.

2526* The Plastic Deformation Mechanism on Metal Cutting Operations and Resulting Deformations. **Contribution à l'étude du mécanisme de déformation plastique de la coupe des métaux et de l'état déformé résultant.** (French.) Paul Bastien and Michel Weisz. *Revue de métallurgie*, v. 52, no. 11, Nov. 1955, p. 837-863.

Current literature is critically reviewed. Study is based on experimental examination of oriented crystal structure of chips. Results are related to shearing and chip friction angles, and rake. Graphs, diagrams, photographs, micrographs, tables. 20 ref.

2527* Acetylene in Heavy Industry. **L'acetylene dans l'industrie lourde.** (French.) E. J. H. Elsworth. *Revue de la soudure (Brussels)*, v. 11, no. 3, 1955, p. 117-125.

Description of industrial practices, which, because of their particular nature, require the utilization of oxy-acetylene. Photographs.

2528* Compactness and Oxygen Content of Effervescent Basic Bessemer Steel Ingots Hot-Rolled Into Strip Steel. **Compacité et teneur en oxygène des lingots d'acier effervescent laminés en bandes.** (French.) M. Nepper. *Revue universelle des mines*, v. 11, ser. 9, no. 10, Oct. 1955, p. 516-520.

Research on flat ingots for rolling into strip steel shows that the compactness of effervescent steel is a direct function of degassing of the pouring basin. Graph, tables, photograph.

2529* Belgian Research on Machinability of Metals. **Recherches belges sur les propriétés d'usinabilité des métaux.** (French.) H. Herbiet and L. Czaplicki. *Revue universelle des mines*, v. 11, ser. 9, no. 11, Nov. 1955, p. 544-558.

Results of research on the development of special test equipment; determination of machinability of certain Belgium steel and a comparison with American steel of the same type. Determination of differences in machinability of steels in order to improve the quality of Belgium steels. Tables, diagrams, photographs, micrographs.

2530* Electro-Erosive Method of Metal Machining. **Die elektroerosive Bearbeitung von Metallen.** (German.) H. Opitz. *Revue universelle des mines*, v. 11, ser. 9, no. 11, Nov. 1955, p. 562-568.

Short review of methods other than with machine tools. Conditions of operation, equipment, advantages, and application of the electro-erosive method. Diagrams, table, photographs, micrographs. 4 ref.

2531* Technological Aspects of the Shaping of Metals by Cold Deformation. **Aspect technologique de la mise a forme par déformation a froid du métal.** (French.) Raoul Molle. *Revue universelle des mines*, v. 11, ser. 9, no. 11, Nov. 1955, p. 568-582.

Analysis of the process of cold deformation of metal. Methods of metal forming based on cold deformation such as rolling, stamping, pressing, extrusion, and deep drawing. Optimum condition of operation, fields of application, and advantages of each method. Graphs, diagrams. 2 ref.

2532* Contribution to the Analytical Study of Efficiency of Lubricants Used in Metal Machining. **Contribution a l'étude analytique de l'éfficacité des lubrifiants utilisés dans la coupe des métaux.** (French.) F. Eugène. *Revue universelle des mines*, v. 11, ser. 9, no. 11, Nov. 1955, p. 582-594.

Comparison of conditions of dry and lubricated machining. Influence of lubricant on the temperature of cutting, and on wear resistance of tools. Tables, graphs, micrographs. 5 ref.

2533 The Rolling of Metals and Alloys. VIII. Resistance to Deformation During Hot Rolling. E. C. Larke. *Sheet Metal Industries*, v. 32, no. 344, Dec. 1955, p. 939-944.

The plant employed to obtain values of the resistance to deformation needed for computing hot-rolling loads is briefly described, followed by an explanation of the construction of groups of curves which relate this property to the rate of deformation, the working temperature and the magnitude of the reduction effected. Graphs, photograph, tables. (To be continued.) 2 ref.

2534* Drawing of Heat-Resistant Alloy With High Pressure Jet Cooling Liquid. **Protiagivanie zharoprochnogo splava s podvodom zhidkosti vysokonapornoi strui.** (Russian.) N. F. Pronkin. *Stanki i instrument*, v. 26, no. 11, Nov. 1955, p. 26-27.

Die cooling system, using a 10% emulsion with 2% of sulfo-"fresol" with jet aperture of 1-mm. and pressure of 25 kg. per sq. cm., doubles the life of dies. Graphs, diagrams.

2535 Shell Making With the New Look. Robert F. Huber. *Steel*, v. 137, Dec. 19, 1955, p. 88-91.

Forging equipment and operations. Newly designed heat-treat handling equipment utilizes completely automatic cycle to harden, quench, draw, and cool the shells. Photographs.

2536 Small Piercing Punches. Federico Strasser. *Steel Processing*, v. 41, Dec. 1955, p. 769-771, 798.

The design and materials used in small round punches to decrease the problems connected with the use of cutting dies. Diagrams.

2537* Importance of Degree of Deformation in Forging Operations. **Důležitost stupné deformace v tvářecí technice.** (Czech.) M. Šulc. *Strojírenství*, v. 5, no. 8, Aug. 1955, p. 589-591.

Influence of degree of deformation on mechanical properties of steel; effect of forging action on grain size. Equations for determining degree of deformation under various types of forging techniques. Graphs, tables, diagram. 3 ref.

2538* Mechanical-Chemical Lapping. **Mechanicko-chemické lapování.** (Czech.) J. Říčka. *Strojírenství*, v. 5, no. 9, Sept. 1955, p. 682-684.

Chemical effects acting on surfaces being machine-finished. Comparison of usual superfinish with mechanical-chemical lapping, and advantages of the later. Tables, graphs, diagram. 8 ref.

2539* Strength of Sintered-Carbide Cutting Inserts. **Pevnost břitových destiček ze slinutých karbidů.** (Czech.) J. Koloc and J. Preisler. *Strojírenství*, v. 5, no. 10, Oct. 1955, p. 751-758.

Effect of different moduli of elasticity of cutting tip and tool shank. Factors affecting life of cutting tools. Photographs, tables, graphs, diagrams. 7 ref.

2540* Measuring Sheet Thickness During Cold Rolling. **Měření tloušťky pásů během válcování za studena.** (Czech.) F. Wiesner. *Strojírenství*, v. 5, no. 10, Oct. 1955, p. 779-785.

Mechanical, electrical, and optical equipment for direct contact measurement; and pneumatic, magnetic, ultrasonic, and X-ray apparatus as indirect contact devices. Methods of combing continuous measurement with automatic control to insure even thickness. Diagrams. 8 ref.

2541* How to Cut Steel Semiproducts and Castings of Great Thickness. **Kak rezat' stal'nye zagotovki i slitki bol'shoi tolshchiny.** (Russian.) A. N. Shashkov and S. G. Guzov. *Svarochnoe proizvodstvo*, 1955, no. 11, Nov., p. 23-26.

Nature of two processes taking place in metal being cut. Design and operation characteristics of O torches and oxy-cutting machines. Tables, photographs, diagrams. 6 ref.

2542 Machinery for Sheet Metal Fabrication. John W. Langton. *Welding and Metal Fabrication*, v. 23, Dec. 1955, p. 451-454.

Surveys some portions of the sheet metal working field to note any improvements which have been made in design to increase outputs or usefulness. Covers most commonly used items. Photographs.

Books and Miscellaneous Publications

2543 Fundamentals of Press Tool Design. W. F. Walker. 152 p. 1955. Philosophical Library, New York. (TS253 W15f)

Identifies and clarifies the fundamental requirements for press operations to permit design of tools which can be operated efficiently and economically.

METALS—METALLOGRAPHY, TRANSFORMATIONS, AND STRUCTURES

2544* **Theory of the Formation of Lattice Defects During Plastic Strain.** (English.) G. H. Van Bueren. *Acta Metallurgica*, v. 3, no. 6, Nov. 1955, p. 519-524.

Presents a theory to show the relation between plastic strain and concentration of vacancies, dislocations, and interstitials, and studies the behavior of dislocation sources under a varying applied shear stress. Compares theoretical deductions and the strain dependance of the electrical resistivity of Cu. 14 ref.

2545* **Interaction Between Dislocations and Interstitial Atoms in Body-Centered Cubic Metals.** (English.) A. W. Cochardt, G. Schoek, and H. Wiedersich. *Acta Metallurgica*, v. 3, no. 6, Nov. 1955, p. 533-537.

The theory of Cottrell and Bilby on the locking of dislocations is extended and it was found that C atoms near an edge dislocation are spread out over all angles below the slip plane and are concentrated in a neighborhood of the slip plane rather than at positions just below the dislocation. Diagrams, graphs. 16 ref.

2546* **The Influence of Thin Intermediate Layers on Interdiffusion in Copper-Nickel Couples.** (English.) M. L. Mehta and H. J. Axon. *Acta Metallurgica*, v. 3, no. 6, Nov. 1955, p. 538-541.

Effect of thin electrodeposited layers of Au, Sn, Zn, and Cd on the interdiffusion between fully annealed Ni rod and electrodeposited Cu. Graphs. 8 ref.

2547* The Shape of Particles During Precipitation of Carbide in Alpha-Iron. **Die Teilchenform bei der karbidausscheidung aus dem α-Eisen.** (German.) W. Pitsch. *Acta Metallurgica*, v. 3, no. 6, Nov. 1955, p. 542-548.

Combines the two experimental methods of internal friction and electrical resistivity to yield a parameter solely dependent on particle shape. The values of the deduced parameter indicate that the precipitated particles are plate-like. Diagrams, graphs, table. 16 ref.

2548* **Kinetics of Order-Disorder Transformations.** (English.) G. J. Dienes. *Acta Metallurgica*, v. 3, no. 6, Nov. 1955, p. 549-557.

A simple theory, based on chemical rate theory, is presented which is constructed entirely in terms of the long range order parameter and reduces to the Bragg and Williams theory at equilibrium. Graphs, tables. 15 ref.

2549* **The Diffusivity of Hydrogen in Nickel.** (English.) M. L. Hill and E. W. Johnson. *Acta Metallurgica*, v. 3, no. 6, Nov. 1955, p. 566-571.

Hydrogen diffusion was determined at 380 to 1000 C from nonsteady rates of H evolution. Diagram, graphs, tables. 21 ref.

2550* **A Surface Structure Observed on Electrolytically Polished Zinc.** (English.) K. F. Hulme. *Acta Metallurgica*, v. 3, no. 6, Nov. 1955, p. 572-578.

Results indicate that the structure is not a revelation of an internal substructure or "mosaic" of the metal, but is closely associated with the electropolishing process. Diagrams, graphs, micrographs, table. 22 ref.

2551* **An X-Ray Examination of Crystallographic Transformations in Indium-Rich Solid Solutions With Thallium, Lithium and Lead.** (English.) A. Moore, J. Graham, G. K. Williamson, and G. V. Raynor. *Acta Metallurgica*, v. 3, no. 6, Nov. 1955, p. 579-589.

Includes graphs, micrographs, tables. 19 ref.

2552* **Crystallographic Relationships in Aged Copper-Beryllium Alloys.** (English.) J. S. Bowles and W. J. McG. Tegart. *Acta Metallurgica*, v. 3, no. 6, Nov. 1955, p. 590-597.

The geometrical features of the precipitation of CuBe are described consistently by the phenomenological theory developed for martensitic transformations. Diagrams, micrographs, tables. 24 ref.

2553 Surface Metallography Solves Production Problems. A. T. Steer. *American Machinist*, v. 99, Dec. 19, 1955, p. 109-120.

Describes use of high-power magnification to determine causes of failure in storage or service. Photographs, micrographs.

2554 Continuous-Cooling Transformation Characteristics Related to Weldability of a 0.5% C Steel. B. J. Bradstreet and R. L. Wilkins. *British Welding Journal*, v. 2, Dec. 1955, p. 562-566.

Studies by a direct-recording method, using a strain-gauge dilatometer to operate a "function plotter", modified to draw simultaneous dilatation/temperature and time/temperature curves for a small steel specimen. Diagrams, tables, graphs, micrographs. 7 ref.

2555 Crystal Growth and Lattice Imperfections. C. Elbaum. *Canadian Metals*, v. 18, Dec. 1955, p. 36-38, 40.

Theoretical studies on growth of crystals from solutions and vapors, growth on dislocations, and solidifications from the melt. Diagrams, micrographs.

2556* Preparation of Large Uranium Crystals by Change Phase. **Sur la préparation de gros cristaux d'uranium par changement de phase.** (French.) Pierre Lehr. *Comptes rendus*, v. 241, no. 16, Oct. 17, 1955, p. 1043-1044.

Method proposed for X-ray determination of crystal orientation and the degree of their perfection. 1 ref.

2557* Dilatometric Behavior of Alpha Uranium Monocrystals. **Sur le comportement dilatométrique de monocristaux d'uranium α.** (French.) Pierre Lehr and Jean-Paul Langeron. *Comptes rendus*, v. 241, no. 17, Oct. 24, 1955, p. 1130-1133.

Dilatometric behavior as a function of orientation. Determination of the value of linear expansion coefficient according to the three main crystallographic axes. Graph, table. 2 ref.

2558* Determination of Transformation Points of Pure Iron. **Détermination des points de transformation du fer pur.** (French.) Christian Boulanger. *Comptes rendus*, v. 241, no. 17, Oct. 24, 1955, p. 1133-1135.

Utilization of differential thermal analysis and evaluation according to the international thermometric scale of 1948. Pure Fe is refined by treatment in vacuum. 1 ref.

2559* Gravimetric Study of the Influence of Impurities on the Rate of Diffusion in α-Brasses. **Étude pondérale de l'influence des impuretés sur la vitesse de diffusion dans les laitons α.** (French.) André Accary. *Comptes rendus*, v. 241, no. 19, Nov. 7, 1955, p. 1301-1304.

Determination of the influence of Sb, As, P, Si, and Al content on the rate of diffusion by the Zn evaporation method. Graphs.

2560* Influence of Traces of Impurities on Polygonization of Aluminum. **Influence des traces d'impuretés sur la polygonisation de l'aluminium.** (French.) Jean Montuelle. *Comptes rendus*, v. 241, no. 19, Nov. 7, 1955, p. 1304-1306.

Determination of influence of traces of impurities, in the form of Na, Li, Fe, and Mn, on Al recrystallization when heat treated at 630 C. Micrographs, table. 2 ref.

2561* Appearance of Surface Micro-Structures in Iron-Chromium Alloys Subjected to a Selective Oxidation Reaction. **Sur l'apparition de microstructures superficielles dans les alliages fer-chrome soumis à une réaction d'oxydation sélective.** (French.) Jean Moreau and Jacques Bénard. *Comptes rendus*, v. 241, no. 22, Nov. 28, 1955, p. 1571-1573.

Analysis of the mechanism of selective oxidation of Cr and Fe-Cr alloys in the presence of H and water vapor mixtures. Micrographs. 7 ref.

2562* Role of the Porosity of Cast Steel in the Segregation of Hydrogen. **Rôle de la porosité de l'acier moulé dans la ségrégation de l'hydrogène.** (French.) Jean Drain and Paul Bastien. *Comptes rendus*, v. 241, no. 22, Nov. 28, 1955, p. 1573-1575.

Study of relationship between H content and porosity in steel ingots. Diagrams. 3 ref.

2563* Influence of Gases on the Structure of Cast Iron. **Contribution a l'étude de l'influence des gaz sur la srtucture de la fonte.** (French.) Georges Blanc and Nicolas Volianik. *Fonderie*, 1955, no. 118, Nov., p. 4755-4770; disc., p. 4770.

Study of the effects of O, H, and N on properties of cast iron after different treatments. Diagrams, photographs, micrographs, tables. 33 ref.

2564* Influenc of Small Amounts of Foreign Elements on the Structure of Cast Iron Pieces and on Their Cracking Tendencies. **Influence de faibles teneurs d'éléments étrangers sur la structure des pièces en fonte et sur l'aptitude a la crique de ces pièces.** (French.) Pierre Détrez and Jeanne Cuvillier. *Fonderie*, 1955, no. 118, Nov., p. 4771-4785.

Study of cracks occurring in the solid state during cooling, either after stripping or enameling. Tables, micrographs, graphs. 8 ref.

2565 Solubility of Nitrogen in Alpha-Iron. J. D. Fast and M. B. Verrijp. *Iron & Steel*, v. 28, Nov. 30, 1955, p. 574-577; disc., p. 625-628.

The results of an investigation in which both the relation between quantity of dissolved N and internal friction and the solubilities of N in α-iron in equilibrium with N_2, Fe_4N, and "Fe_8N" were determined. Graphs, table.

2566 Effect of Alloying Elements on Solubility of N in Fe. I. The Solubility of N in Pure Iron and in 2.83% Si Iron. II. The Solubility of Nitrogen in Alpha-Iron Containing Up to 0.051% V. N. S. Corney, E. T. Turkdogan, S. Ignatowicz, and J. Pearson. *Iron & Steel*, v. 28, Nov. 30, 1955, p. 577-582.

Determines the free energies of solutions of N in solid Fe, Si reduces the solubility in α-Fe and increases the activity coefficient of disolved N. Investigates the influence of small percentages of V in steel on the formation of nitrides at low N potentials and consequently in lowering the solubility of N in Fe. Diagrams, graphs, tables.

2567 Strain Aging of Alpha-Iron. W. R. Thomas and G. M. Leak. *Iron & Steel*, v. 28, Nov. 30, 1955, p. 583-586; disc., p. 628-631.

Precise data on the rates of strain aging on specimens that contained only N and those with C only. Graphs, table.

2568 Strain-Aging of Pure Iron. B. Jones and R. A. Owen-Barnett. *Iron & Steel*, v. 28, Nov. 30, 1955, p. 587-589; disc., p. 628-631.

Effect of preliminary temper-rolling and tensile-stressing. Graphs, tables.

2569 Siliceous Inclusions. R. E. Lismer and F. B. Pickering. *Iron & Steel*, v. 28, Nov. 30, 1955, p. 589-591; disc., p. 631-633.

X-ray analysis of residues from several ingots deoxidized by Si. Tables, micrographs.

2570 Titaniferous Inclusions. F. B. Pickering. *Iron & Steel*, v. 28, Nov. 30, 1955, p. 591-593; disc., p. 631-633.

A microscopical examination of Fe samples under normal vertical illumination and polarized light; crystalline constituents of ingot residues were determined by X-ray analysis of alcoholic iodine residues. Micrographs, table.

2571 Metallography of Delta-Ferrite. I. Eutectoid Decomposition. II. Formation of Delta-Eutectoid in 18-4-1 Type High-Speed Steels. III. Isothermal Transformation

of Delta-Ferrite in a Low-Carbon 27-5-1.5 Cr-Ni-Mo Steel. IV. Decomposition of Delta-Ferrite Between 650 and 1000 C in a Low-Carbon 18/10/3 Cr-Ni-Mo Steel. V. Delta-Eutectoid and the Constitution Diagram of the Fe-M-C System. Kehsin Kuo. *Iron & Steel*, v. 28, Nov. 30, 1955, p. 593-620; disc., p. 633-635, 640.

Includes micrographs, graphs, tables, diagrams.

2572* Distribution Equilibrium of Chromium Between Molten Pig Iron and Slag. (Japanese.) Toshio Niinomi, Yukio Matsushita, and Kuro Kanamori. *Iron & Steel Institute of Japan, Journal*, v. 41, no. 10, Oct. 1955, p. 1075-1081.

Results of study on the reduction equilibrium of Cr in the temperature range of 1350 to 1500 C and the slag basicity CaO/SiO_2 ranging from 0.6 to 1.4 under one atmosphere pressure of CO. Graphs, tables, diagram. 13 ref.

2573* Thermodynamic Investigation of Nonmetallic Inclusions in Steel. I. Behavior of Aluminum-, Silicon- and Iron-Nitrides and Their Effect on Austenitic Grain Size of Steel. (Japanese.) Hiroshi Sawamura and Toshisada Mori. *Iron & Steel Institute of Japan, Journal*, v. 41, no. 10, Oct. 1955, p. 1082-1090.

Both Al- and Si-nitrides are estimated to be effective as grain-growth inhibitors, although the latter may be less effective than the former. Some considerations are given about non-metallic inclusions which act as grain-growth inhibitors. Diagrams, tables, graphs.

2574 The Effects of Sulphur, Selenium, and Tellurium on Graphite Formation in an Fe-C-Si Alloy. S. Garber. *Iron and Steel Institute, Journal*, v. 181, Dec. 1955, p. 291-302 + 6 plates.

The effects of melting temperature and cooling rate on graphite formation have been determined on alloys of hypo-eutectic and eutectic composition. Changes of graphite morphology induced in the alloy by S or Se additions result from modifications in the nucleation of the graphite and from the growth rate of the eutectic austemite. Tables, graphs, diagram, micrographs. 25 ref.

2575 The Structure of Lithium-Magnesium Solid Solutions. II. Measurements of Diffuse X-Ray Scattering. F. H. Herbstein and B. L. Averbach. *Massachusetts Institute of Technology, Department of Metallurgy (U. S. Atomic Energy Commission)*, NYO-7050, Sept. 1955, 23 p. (UF767 U3ny)

A preference for unlike nearest neighbors is indicated by diffuse X-ray scattering data from BCC solutions of Li-Mg alloys. Individual atoms are displaced from average lattice sites. The Li-Mg interatomic distance is shorter than the average of the distances between like atoms. Graphs. 13 ref.

2576* Pearlitic Transformation in Alloy Steel. **Perlitnoe prevrashchenie v legirovannoi stali.** (Russian.) M. E. Blanter. *Metallovedenie i obrabotka metallov*, 1955, no. 4, Oct., p. 1-15.

Formation of carbides, and change of Cr, Mn, Si, Mo, and other contents in carbides and ferrite in relation to isothermal annealing time. Effect of alloying elements on kinetics of pearlitic transformation. Graphs, micrographs. 37 ref.

2577* Effect of Stresses on the Processes of Aging the Alloy EI 437 at 750 C. **Vliianie napriazhenii na protsessy stareniia splava EI 437 pri 750°.** (Russian.) V. A. Parfenov. *Metallovedenie i obrabotka metallov*, 1955, no. 4, Oct., p. 16-19.

Micro-structures and microcracks in fatigue-tested specimens. Micrographs. 10 ref.

2578* Influence of Alloying Elements on the Graphitization Kinetics of White Cast Iron. **Vliianie legiruiushchikh elementov na kinetiku protsessa grafitizatsii belogo chuguna.** (Russian.) M. A. Krishtal. *Metallovedenie i obrabotka metallov*, 1955, no. 4, Oct., p. 24-27.

Order of intensity of influence by Al, Si, Ni, Co, Cu, V, and Cr. Relation between distortion of lattice of alloyed austenite and absolute magnitude of difference of atomic diameters of alloying element and Fe. Table. 21 ref.

2579* Relation Between Position of Martensitic Point and State of the Austenite. **Zavisimost' polozheniia martensitnoi tochki ot sostoianiia austensita.** (Russian.) G. A. Oding. *Metallovedenie i obrabotka metallov*, 1955, no. 4, Oct., p. 28-31.

Intensiveness of austenitic transformation. Effect of rate of cooling. Stresses in individual austenitic grains. Graphs. 9 ref.

2580* Causes of Crack Formation in Carburized Parts and Preventive Measures. **Prichiny obrazovaniia treshchin v tsementovannykh izdeliiakh i mery bor'by s nimi.** (Russian.) E. I. Malinkina. *Metallovedenie i obrabotka metallov*, 1955, no. 4, Oct., p. 39-47.

Effect of C-content-temperature relation on austenitic-martensitic transformation and of isothermal transformation time, at various temperatures, on structure of carburized layer. Distribution of residual stresses. Graphs, micrographs, photographs.

2581 The Isothermal Transformation Characteristics of Carburized 2% Nickel-Molybdenum Steel. G. Mayer and R. H. Hickley. *Metallurgia*, v. 52, no. 313, Nov. 1955, p. 236-239.

Isothermal-transformation diagrams of steels representing the core and four positions for a carburized 2% Ni-Mo steel were determined. The mechanical properties of steels of typical core composition are included. Graphs, tables. 11 ref.

2582 Recrystallization in Metals as a Recovery-Nucleated Process. A. J. Kennedy. *Metallurgia*, v. 52, no. 314, Dec. 1955, p. 265-269.

A review of some recent developments in ideas concerning the origin and characteristics of recrystallization nuclei. Graphs. 33 ref.

2583 Metallography of Thorium. R. J. Gray and M. J. Feldman. *Metallurgy Development Advisory Committee (U. S. Atomic Energy Commission)*, TID-5117, Feb. 1952, 27 p. (UF767 Un3ti)

A compilation of notes from the Fifth Metallographic Conference, Westinghouse Atomic Power Division on the preparation of a series of Th samples. Micrographs, tables.

2584* How to Understand Annealing and Hot Working of Metals. Samuel Storchheim. *Metalworking Production*, v. 99, Dec. 23, 1955, p. 2169-2176.

Basic essentials and theory of hot working and annealing. Graphs, diagrams, micrographs, tables.

2585* Metallurgical Application of Wet-Process Autoradiography. George C. Towe, Henry J. Gomberg, and J. W. Freeman. *Nondestructive Testing*, v. 13, Nov.-Dec. 1955, p. 36-39.

Deals with methods of preparing metal specimens for autoradiographic examination, and results obtained with the technique. Micrographs, diagram, table. 3 ref.

2586 The Lattice Spacings of Solid Solutions of Titanium, Vanadium, Chromium, Manganese, Cobalt and Nickel in α-Iron. A. L. Sutton and W. Hume-Rothery. *Philosophical Magazine*, v. 46, 7th ser., no. 383, Dec. 1955, p. 1295-1309.

Measurements of the lattice spacings in α-iron, formed by the elements from Ti to Ni, are compared with solid solutions in Ru formed by the corresponding elements in the second long period and with those obtained for solid solutions in Ni. Tables, graphs. 17 ref.

2587 Surface Distributions of Dislocations in Metals. C. J. Ball and P. B. Hirsch. *Philosophical Magazine*, v. 46, 7th ser., no. 383, Dec. 1955, p. 1343-1352.

Experimental data on the nature of dislocation boundaries in deformed crystals. Tables, diagrams. 17 ref.

2588 Electrolytic Etching at Small-Angle Grain Boundaries in Germanium. S. G. Ellis. *Physical Review*, v. 100, ser. 2, Nov. 15, 1955, p. 1140-1141.

Difference of appearance between n-type and p-type Ge crystals, which have been anodically etched, can be explained if only the hole current contributes to the etching. An n-type crystal can be made to etch in the same way as a p-type crystal if injected holes reach the crystal-electrolyte interface. Hole-electron recombination within the crystal can then reduce the rate of etching. Diagrams. 4 ref.

2589* Diffusion of Silver in Silver-Zinc and Silver-Cadmium Alloys. (English.) Tokutaro Hirone, Motoharu Kimura, Toshio Kitagaki, Nobuhiko Kunitomi, and Yosimitsu Sugita. *Physical Society of Japan, Journal*, v. 10, no. 11, Nov. 1955, p. 967-970.

Diffusivity of Ag^{110} in alloys containing about 30% Zn or Cd measured by means of surface counting. The results show that the Ag atoms diffuse most rapidly in the lattice of Ag-Zn and that the diffusivity of Ag in Ag-Cd is still higher than that in Ag itself. Graphs. 7 ref.

2590* Some Observations on Dislocations in Copper Crystals. (English.) Hideji Suzuki. *Physical Society of Japan, Journal,* v. 10, no. 11, Nov. 1955, p. 981-995.

Well-developed octahedral and cubic faces have been obtained in recrystallized Cu by annealing the material at a temperature close to the melting point. Micrographs, diagrams. 8 ref.

2591* Aging Process in Quenched Aluminium-Zinc Solid Solutions. (English.) Ken-ichi Hirano. *Physical Society of Japan, Journal,* v. 10, no. 11, Nov. 1955, p. 995-1002.

Investigates the relation between the low- and high-temperature aging. Graphs. 17 ref.

2592* Observations of Dislocations Along Grain Boundaries in Germanium Crystals. (English.) Jun'ichi Okada. *Physical Society of Japan, Journal,* v. 10, no. 11, Nov. 1955, p. 1018-1019.

Study of the dislocations, by means of the etching process, gave results which verify the properties of dislocations along the small-angle-of-misfit grain boundaries. Micrographs. 2 ref.

2593* On the Magnetic Ageing of Pure Iron. II. (English.) Mitsuru Asanuma and Sinji Ogawa. *Physical Society of Japan, Journal,* v. 10, no. 11, Nov. 1955, p. 1025-1026.

Wire of commercial pure Fe is purified by annealing in a wet H atmosphere, 0.0065 wt.% N was dissolved into the specimen, and the aging was investigated by the measurement of internal friction at 140 C. Graphs. 6 ref.

2594 The Binding Energy of Nitrogen in a Dislocation. W. R. Thomas and G. M. Leak. *Physical Society, Proceedings,* v. 68, no. 432B, Dec. 1955, p. 1001-1007.

Equilibrium is considered between N atoms in free solution and N atoms bound in dislocation sites. The value for the binding energy of N atoms in dislocation sites is estimated as lying between 0.75 and 0.8 e.v. per N atom. Graphs, table. 12 ref.

2595 Magnetic Domain Structure in Twinned Crystals of Silicon Iron. R. Street and E. O. Hall. *Physical Society, Proceedings,* v. 68, no. 432B, Dec. 1955, p. 1033-1037.

Examination, by colloid deposition techniques, of the influence on the domain structure caused by the presence of twin bands. Diagram, graph. 8 ref.

2596 The Structure of Cold Worked Gold. I. A Study by Electron Diffraction. P. B. Hirsch, A. Kelly, and J. W. Menter. *Physical Society, Proceedings,* v. 68, no. 432B, Dec. 1955, p. 1132-1145.

Experimental results show that it is possible to obtain information about the structure from a detailed study of the number, shape and arrangement of spots on the transmission electron diffraction pattern from a thin foil. Diagrams, tables. 23 ref.

2597* Preparation of Monocrystals With Low Fusion Point. Description of New Equipment and Initial Results. **La préparation de monocristaux de métaux à bas point de fusion. Description d un nouvel appareillage et premiers résultats.** (French.) G. P. Bolognesi. *Revue de métallurgie,* v. 52, no. 11, Nov. 1955, p. 909-911.

Uses a vertical continuous-heating furnace which automatically adjusts mold temperatures up to 1000 C. Graph, diagrams, photographs. 4 ref.

2598* Processes to Obtain a Polygonized State With an Alpha-Brass Solid Solution. **Divers procédés permettant d'obtenir l'état polygonisé d'une solution solide laiton alpha.** (French.) H. J. Latière and R. Michaud. *Revue de métallurgie,* v. 52, no. 11, Nov. 1955, p. 912-914.

Polygonized α-brass was made by fusion and quick cooling to avoid monocrystallization. Further working and annealing was required for stability. Laue patterns. 9 ref.

2599* Dislocation of Crystal Boundaries in Secondary Recrystallization. **O premikih kristalnih mej ob sekundarni rekristalizaciji.** (Slovenian.) Matija Žumer and Franc Širca. *Rudarsko-metalurški zbornik,* 1955, no. 3, p. 173-178.

Study of ferrite grain changes in recrystallization at 1050 to 1100 C. Describes two possible mechanisms of the process. 4 ref.

2600 On the Solution-Body Phenomenon and Anisotropy of Solution Rate in Zinc Crystal. (English.) Mikio Yamamoto and Jirô Watanabé. *Science Reports of the Research Institutes, Tôhoku University,* ser. A, v. 7, no. 3, June 1955, p. 262-268.

Solution rate of Zn crystal in nitric acid was found to be isotropic circular rod crystals etched with concentrated and dilute hydrochloric acids formed solution bodies characteristics of their orientations. Table, diagrams, graph, photographs. 8 ref.

2601* Formation of Superlattice in Face-Centered Cubic Lattice With a Special Reference to the Copper-Platinum System. (English.) Tokutaro Hirone and Kengo Adachi. *Science Reports of the Research Institutes, Tôhoku University,* ser. A, v. 7, no. 3, June 1955, p. 282-293.

Many types of superlattices appeared in the alloys of the system according to relative concentration changes of the component metals. This phenomenon was attributed to the second neighbor interaction and to change of this value accompanied by an increase of *s*-electrons due to the addition of Cu. Diagram, graphs, tables. 11 ref.

2602 Nondestructive Determination of Grain Size in Metals. Nicholas Grossman. *Sylvania Electric Products, Inc. (U. S. Atomic Energy Commission),* SEP-184, Aug. 1955, 31 p. (UF767 Un3.1se)

The ultrasonic methods explored were: through transmission and pulse technique; amplitude decay, and back reflections counting. The results obtained on brass, steel, and Zr are described. Micrographs, diagrams, graphs, photographs, tables. 15 ref.

2603* Properties of Metallic Solutions. **Svoistva metallicheskikh rastvorov. V.** Influence of Zinc, Aluminum, Cadmium, Manganese, and Bismuth on Properties of Liquid and Solid Tin. **O vliianii tsinka, aliuminiia, kadmiia, margantsa i vismuta na svoistva zhidkogo i tverdogo olova.** (Russian.) N. L. Pokrovskii and M. Saidov. *Zhurnal fizicheskoi khimii,* v. 29, no. 9, Sept. 1955, p. 1601-1609 + 1 plate.

Effect of alloying additions on the β-α transformation in Sn. Tables, graphs, diagrams, micrographs. 25 ref.

METALS—POWDER

2604 Friction Materials—A New Field for Ceramics and Cermets. R. H. Herron. *American Ceramic Society Bulletin,* v. 34, Dec. 1955, p. 395-398.

Cermet materials have contributed greatly to aircraft brake problems and other less severe applications. Such materials may be the only answer to high temperature seal and bearing problems. Graphs, photographs.

2605 Technical Properties of Iron Powder Magnets. E. H. Carman. *British Journal of Applied Physics,* v. 6, Dec. 1955, p. 426-429.

Measurements of coercive force, remanence and maximum energy product of Fe compacts are made as functions of density packing and X-ray particle size. Graphs, tables. 9 ref.

2606* Recent Soviet Research on the Effects of Additives in Alumina Sintering. W. G. Cass. *Ceramic Age,* v. 66, Dec. 1955, p. 16-18.

Liquid phase sintering; relation of melt to sintering; modes of production; and precipitation of alumina. 12 ref.

2607* Powder-Metallurgy of Iron and Steel—Review. (Japanese.) Haruo Kubota. *Iron & Steel Institute of Japan, Journal,* v. 41, no. 10, Oct. 1955, p. 1119-1130.

Includes photograph, tables, graphs. 18 ref.

2608 Effect of Irradiation on Hot-Pressed Boron Carbide. W. D. Valovage. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission),* KAPL-1403, Nov. 1955, 45 p. (UF767 Un3.1ka)

Specimens were irradiated in vacuo, He, and Na to determine quantity of He released and physical stability of the material after burnups as high as 36% of B-10 atoms. Micrographs, diagrams, tables, photographs.

2609 Iron Powder Parts Improved by Heat Treatment. F. L. Spangler. *Materials & Methods,* v. 42, Dec. 1955, p. 102-104.

Steam treatment and carburizing improve strength, corrosion resistance, and appearance. Photographs.

2610 Nickel Refining. Sidney Nashner. *Metal Industry,* v. 87, Dec. 23, 1955, p. 527-528.

Operation of major processes at a refinery for Ni powder production. Tables.

2611 Metal Sinterings. *Metal Industry*, v. 87, Dec. 23, 1955, p. 531-533.

Some applications of the powder metal process to the production of small parts for machinery. Photographs.

2612* Dilatometric Investigation of Contraction in Process of Sintering Powder Metals. **Dilatometricheskoe issledovanie usadki v protsesse spekaniia poroshkoobraznykh metallov.** (Russian.) V. N. Goncharova. *Metallovedenie i obrabotka metallov*, 1955, no. 3, Sept., p. 51-53.

Investigates linear contraction of the composition iron-graphite-copper during heating up to 1050 to 1070 C at a rate 200 C per hr., and cooling in the same furnace. Graphs.

2613* Some Physico-Chemical Properties of Titanium Boride and Nitride Alloys. **Nekotorye fiziko-khimicheskie svoistva splavov borida i nitrida titana.** (Russian.) G. V. Samsonov and E. V. Petrash. *Metallovedenie i obrabotka metallov*, 1955, no. 4, Oct., p. 19-24.

Examines compositions, melting temperatures, microhardness, thermal coefficient of linear expansion, lattice period, electrical resistance, micro-structure, and resistance to oxidation. Graphs, tables, micrographs, diagram. 10 ref.

2614 Characteristics of Copper-Infiltrated Porous Iron. J. E. Elliott. *Metallurgia*, v. 52, no. 313, Nov. 1955, p. 226-234.

Structural changes in the skeleton during infiltration can be explained in terms of alloying effects. Graphs, tables, maps. 5 ref.

2615 Powder Metallurgy Makes Better Reactor Fuels and Components. *Nucleonics*, v. 13, Dec. 1955, p. 24-26.

Techniques and advantages of powder metallurgy for reactor uses. Better resistance to radiation and applicability to unusual combinations are two main reasons for high interest in these methods. Micrographs, diagrams, table. 11 ref.

2616* Possibility and Limits of Powder Metallurgy. **Possibilités et limites de la métallurgie des poudres.** (French.) Michel Zeicher. *Revue universelle des mines*, v. 11, ser. 9, no. 11, Nov. 1955, p. 594-605.

Production methods and application of metals with high melting points; metal, metal-ceramic, and porous compounds; semiconductors and pseudo-alloys of metals and metalloids. Future of powder metallurgy. Photographs, diagrams. 36 ref.

2617* Magnetic Behavior of Fe-Ni Compacts Under Sintering Process. (English.) Hiroshi Kojima. *Science Reports of the Research Institutes, Tôhoku University*, ser. A, v. 7, no. 3, June 1955, p. 321-328.

Density increase accompanying a rise in sintering temperature was independent of the alloy composition, but the magnetic saturation of higher Ni compact approached the solid alloy's value more rapidly than lower Ni specimens. Graphs. 12 ref.

2618* Improving the Quality of Sintered Carbides. **Za zvýšení jakosti slinutých karbidů.** (Czech.) B. Čech. *Strojírenství*, v 5, no. 11, Nov. 1955, p. 841-844.

Cutting tool strength and endurance, and their effects on cutting operations. Effect of composition and manufacturing methods on quality. Graph, diagrams. 7 ref.

Books and Miscellaneous Publications

2619 A Handbook of Hard Metals. W. Hawihl. 162 p. 1955. Her Majesty's Stationery Office, London. (TA490 D32h)

Principles of the sintering technique, technical production, and principles for manufacturing hard metals into tools.

MINING ENGINEERING

2620 Some Problems of Deep Drilling. W. M. Booth. *Canadian Mining and Metallurgical Bulletin*, v. 48, no. 524, Dec. 1955, p. 764-768; *Canadian Institute of Mining and Metallurgy, Transactions*, v. 58, 1955, p. 438-442.

Problems encountered, include casing and hole size programs, drill pipe and tubing, hoisting equipment, mud circulation system, cementing, and well evaluation. Graphs. 7 ref.

2621* Contributions of German Authors to the Centennial Congress of the Mineral Industry. **Beiträge deutscher Verfasser zum Jahrhundertkongress der Société de l'Industrie Minérale.** (German.) *Glückauf (Supplement)*, v. 91, Aug. 1955, 230 p.

A collection of articles on, deposits of coal, mechanization of mining and loading, utilization of electricity in underground mining, and perspectives in mining and coking.

2622* Development of Ideas From the Office of the Director, and Techniques in Petroleum Geology. **Le développement des idées directrices et des techniques en géologie pétrolière.** (French.) J. Flandrin. *Revue de l'institut français du pétrole et Annales des combustibles liquides*, v. 10, no. 9, Sept. 1955, p. 1039-1052 + 1 plate.

The evolution of the concepts relating to the significance of the oil showings, the formation of source rocks and the origin of migration of hydrocarbons, prospecting for petroleum gradually moved from the mountain regions towards the sedimentary basins. Graphs, photographs, map.

See also: **2166** (petroleum and production).

NONDESTRUCTIVE TESTING

2623 Xeroradiography. Peter J. Farmer. *Aircraft Production*, v. 18, Jan. 1956, p. 8-12.

A new technique that is being developed to overcome some of the limitations of radiographic examination. Diagrams, graphs, micrographs, photographs.

2624 Industrial Applications of Ultrasonics. E. G. Richardson. *British Journal of Applied Physics*, v. 6, Dec. 1955, p. 413-415.

Possibilities and limitations of ultrasonics for echo-detection, H.F. agitation, and metallurgical applications. Photographs, diagrams. 6 ref.

2625 A Tramp-Metal Detector. M. H. Goosey. *E. I. Du Pont de Nemours & Co. (U. S. Atomic Energy Commission)*, DP-135, Oct. 1955, 12 p. (UF767 Un3.1dp)

Iron particle volumes of 3×10^{-4} cubic in. are easily detected inside on alloy rod 1-in. in diameter. Photographs, diagrams.

2626 Temperature-Indicating Material Used for Weld Inspection. D. Lichtman. *Iron Age*, v. 176, Dec. 8, 1955, p. 146-147.

New, fast method of weld inspection using an optical scanning device and a temperature-indicating material is well-suited to automatic production by inert gas-shielded arc welding. Up to 12,000 welds can be examined in an hr. Photographs, diagram.

2627 High-Speed Unit Performs Three-Way Inspection. *Iron Age*, v. 176, Dec. 15, 1955, p. 100-102.

Continuous electromagnetic analysis of non-magnetic or paramagnetic materials now appear feasible at speeds in excess of 300 ft. per min. Nondestructive technique is more sensitive and reveals more information than previous methods. Photographs.

2628* New Data on Nondestructive Testing by Ultrasonics. **Neue Erkenntnisse bei der zerstörungsfreien Werkstoffprüfung mittels Ultraschall.** (German.) R. Pohlman. *Metalen*, v. 10, no. 22, Nov. 30, 1955, p. 471-473.

Details of continuous and of impulse-echo processes. Photographs, table.

2629* Ultrasonic Inspection Speeds Drive-Tubing Output. Leo Adams. *Metalworking Production*, v. 99, Nov. 11, 1955, p. 1905-1907.

Equipment, methods, and advantages of continuous inspection of 3-in. steel tubing weld quality. Photographs, diagram.

2630* Field Evaluation of Industrial Xeroradiography. Grover M. Taylor and Gerold H. Tenney. *Nondestructive Testing*, v. 13, Nov.-Dec. 1955, p. 12-17.

Data on radiographic resolution, sensitivity, and speed, in which various energies were used. Photographs, diagrams, micrographs, tables. 3 ref.

2631* Nondestructive Grain Size Measurements With Ultrasonics. D. L. Worlton. *Nondestructive Testing*, v. 13, Nov.-Dec. 1955, p. 24-26.

The degree to which ultrasonic energy is absorbed in traveling through brass is related to the wave length associated with the ultrasonic waves and average grain diameter of the metal. A curve obtained establishes this relationship for cylindrical samples and suggests a means of quantitative measurement of diameters. Micrographs, graphs, photographs, diagram.

2632 Gamma-Radiographic Control of Welded Transmission Pipelines. II. C. C. Bates. *Welding and Metal Fabrication*, v. 23, Dec. 1955, p. 465-471.

Discussion of staffing, records, and economics of the project. Diagrams, graphs, tables, photographs. 10 ref.

See also: **2420** (ultrasonic control during heat treatment); **2458** (sonic techniques in determining elastic constants).

NUCLEAR PHYSICS, NUCLEONICS, AND RADIATION

2633 Annual Review of Nuclear Science, (Annual Volume), v. 5, 1955, 448 p. Annual Reviews, Stanford, Calif. (QC780 An78)

Fourteen papers covering work on nuclear reactions, radiation shielding, reactor design, industrial applications, radiation chemistry, mass spectra, and radiobiology.

2634 Pilot Plant for Separation of Reactor Fuel Elements. W. R. Page, C. J. Raseman, E. I. Goodman, and C. H. Scarlett. *Chemical Engineering Progress*, v. 51, Dec. 1955, p. 566-570.

Description of and operating results for separating radioactive compounds from spent reactor fuel by distillation, preceded by fluorination. Photograph, graph, diagrams, tables. 5 ref.

2635* A Nuclear Power Plant. Christopher Hinton. *Chemical Trade Journal and Chemical Engineer*, v. 137, Dec. 2, 1955, p. 1504, 1506, 1508.

Design and construction of an English reactor for production of Pu.

2636 Metallurgy of Nuclear Power Production. A. B. McIntosh. *Engineer*, v. 200, Nov. 25, 1955, p. 759-763.

Metallurgical problems introduced in the preparation and irradiation of U or Pu fuels; principles of protection of the fuel in fuel elements and limitations imposed by interaction of fuel, container, and coolant. Graphs, tables, diagrams.

2637* Chemical Factors in Atomic Power Development. W. M. Campbell. *Engineering Journal*, v. 38, Dec. 1955, p. 1650-1656.

Economic aspects of nuclear power industry, particularly that of Canada, and predicts future rate of development of the industry. Diagrams, graphs, photograph, table. 8 ref.

2638* The Preliminary Design for NPD. H. A. Smith. *Engineering Journal*, v. 38, Dec. 1955, p. 1657-1662.

Objectives, organization for preliminary work, scope of studies, outline specifications, physical design of plant, capital cost estimates, and construction arrangements for the demonstration nuclear-electric power plant to be built in Ontario. Diagrams, graphs, table.

2639 Engineering Aspects of Liquid Metals for Heat Transfer. Thomas Trocki. Paper from HANDBOOK OF NEW NUCLEAR TECHNIQUES. p. 5-9. Nucleonics, New York. (QC776 H19n)

Promise as reactor coolants and heat-transfer fluids for systems operating above 600 F. Tables. 2 ref.

2640 Heat Transfer Analysis of Internally-Externally Cooled Cylindrical Fuel Elements for Nuclear Reactors. F. E. Tippets. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-33434 Rev., Oct. 1954, 39 p. (UF767 Un3.1hw)

Complete detailed development of a non-iterative method of analysis of heat transfer characteristics. Tables. 4 ref.

2641 Hanford Standard Pile. D. E. Davenport, G. L. Lynn, and D. C. Pound. *Hanford Works (U. S. Atomic Energy Commission)*, HW-21793, July 1951, 27 p. (UF767 Un3.1hw)

Describes construction and diffusion length measurement of the standard pile erected for exponential experiments. Presents techniques for accurate flux measurement. Tables, photographs, diagrams.

2642 Measurement of Field Distortion in Free-Air Ionization Chambers by Analog Method. William Miller and Robert J. Kennedy. *Journal of Research, National Bureau of Standards*, v. 55, Nov. 1955, p. 291-297.

Includes graphs, diagram. 8 ref.

2643 A Comparison of Diffusion and Transport Theory Results for the Penetration of Radiation Into Plane Semi-Infinite Slabs. W. D. Barfield. *Los Alamos Scientific Laboratory, University of California (U. S. Atomic Energy Commission)*, AECD-3653, June 1954, 39 p. (UF767 Un3m)

Penetration of radiation into plane semi-infinite slabs of materials was calculated numerically by means of the time-dependent transport theory (Boltzmann equation) and the approximate "diffusion theory." Quantitative results are given for the case of a nonscattering material with constant absorption cross section, and for the general case of a scattering material (B) with absorption coefficient a function of energy. Diagrams, graphs.

2644 A Whole Body Gamma Counter for Human Subjects. Ernest C. Anderson, Robert L. Schuch, J. D. Perrings, and Wright H. Langham. *Los Alamos Scientific Laboratory, University of California (U. S. Atomic Energy Commission)*, LA-1717, Sept. 1955, 43 p. (UF767 U3La)

New 4π liquid scintillation counter for the measurement of the γ activity of human subjects is described, including details of physical construction and operating characteristics. Gives results of the measurement of the γ activity of 62 persons and possible uses of the instrument. Tables, graphs, diagrams, photographs. 13 ref.

2645 Paraffin Cylinders to Measure Neutron Energies. D. S. Young. *Los Alamos Scientific Laboratory, University of California (U. S. Atomic Energy Commission)*, LA-1938, Nov. 1955, 25 p. (UF767 U3La)

Method is presented of measuring average energies in the range from 10 k.e.v. to 4.5 m.e.v. Graphs, photographs, tables. 13 ref.

2646* Application of Radioactive Tracers in the Petroleum Industry. *Lubrication*, v. 43, Dec. 1955, p. 133-144.

Presents background information for understanding of the properties of radioactive isotopes which make them useful as tracers. Describes successful applications in the petroleum industry with the main emphasis on lubrications problems. Tables, diagrams, photographs, graphs. 40 ref.

2647* The 800 kV Particle Acceleration Equipment of the Hungarian Central Research Institute, Department of Nuclear Physics. **KFKI atomfizikai osztályának 800-kV-os részecske gyorsító berendezése.** (Hungarian.) Endre Pásztor and Jánosné Siegler. *Magyar fizikai folyóirat*, v. 3, nos. 5-6, 1955, p. 497-513.

Some problems of ion acceleration and of the calculation and design of acceleration lenses. Technical details of equipment. Photographs, diagrams, tables, graphs. 22 ref.

2648 Studies on Glass Dosimeters. Bernard E. Proctor, Samuel A. Goldblith, and Sol Davison. *Massachusetts Institute of Technology (U. S. Atomic Energy Commission)*, NYO-3345, Final Report for July 1954,-June 1955, 69 p. (UF767 U3ny)

Independent evaluation of Ag-activated phosphate glass for the measurement of the high doses. Tables, graphs, photographs. 11 ref.

2649 Structural Materials for Heat Transfer in Nuclear Reactors. I. Selecting Materials for Liquid Sodium Systems. II. A Zirconium Alloy for Water Systems. R. F. Koenig, E. G. Brush, D. E. Thomas, and F. Forscher. *Materials & Methods*, v. 42, Dec. 1955, p. 110-117.

Problems considered are corrosion resistance, mass transfer, mechanical effects, and transfer of radioactivity, if Na is used as a heat transfer agent. Summarizes the information available on the physical, mechanical, and corrosion properties of Zircaloy-2, and its use in nuclear reactors. Micrographs, graphs, tables, photograph. 5 ref.

2650 First Step in Ultimate Waste Disposal: Concentrating Fission Products. L. P. Hatch and W. H. Regan, Jr. *Nucleonics*, v. 13, Dec. 1955, p. 27-29.

Separating the fission products from bulk wastes is an essential pretreatment before attempting final fixation. Here are ways of doing this for wastes from unalloyed, and Al- and Zr-alloyed fuels. Diagrams, tables. 3 ref.

2651 Examining Irradiated Fuels Under Water. Henry J. Bellarts, John L. Spencer, and Roy S. Peterson. *Nucleonics*, v. 14, Jan. 1956, p. 30-33.

Discusses the primary inspection station, slug cleaner, and dejacketer of an underwater inspection station. Photograph, diagrams.

2652 Carbon Steel Promises Cheaper Reactor Systems. R. U. Blaser and J. J. Owens. *Nucleonics*, v. 14, Jan. 1956, p. 68-71.

Use of C steel in reactor systems; effect of temperatures and velocity on the rate of corrosion.

2653 Production of Fission Product Iodine 131. A. F. Rupp, E. E. Beauchamp, and J. R. Farmakes. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-1047, Dec. 1951, 25 p. (UF767 U3c)

Describes the equipment and process used for the separation and purification of the fission product and the effect of process variables. Diagrams, graph, photographs. 12 ref.

2654 The Cross Section of Xe^{135} as a Function of Energy. S. Bernstein, C. P. Stanford, M. M. Shapiro, J. B. Dial, and T. E. Stephenson. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, AECD-3655, June 1955, 71 p. (UF767 Un3m)

Describes apparatus and procedure used in taking transmission measurements and gives some of the detailed results. Photographs, graphs, tables, diagrams.

2655 Non-Linear Regenerative Extraction of Synchrocyclotron Beams. K. J. LeCouteur and S. Lipton. *Philosophical Magazine*, v. 46, 7th ser. no. 383, Dec. 1955, p. 1265-1280.

Presents a non-linear method for extracting beams with higher energy and greater theoretical efficiency than the linear type. Tables, graphs, diagram. 4 ref.

2656 Mean Free Path for Discrete Electron Energy Losses in Metallic Foils. A. W. Blackstock, R. H. Ritchie, and R. D. Birkoff. *Physical Review*, v. 100, ser. 2, Nov. 15, 1955, p. 1078-1083.

Energy losses are studied as a function of incident energy. In foils of Al, Mg, and Cu, bombarded with electrons of energies 25 to 115 k.e.v., the losses appear at multiples of 14.9 and 10.7 e.v. respectively for Al and Mg whereas only one loss is found in Cu at 22.6 e.v. The mean free paths for the losses are determined for the three metals. Table, graphs. 26 ref.

2657 Effect on X-Ray Fine Structure of Deviations From a Coulomb Field Near the Nucleus. A. L. Schawlow and C. H. Townes. *Physical Review*, v. 100, ser. 2, Dec. 1, 1955, p. 1273-1280.

Compares several types of information now available and certain deviations from a Coulomb field not directly connected with nuclear size. Table, graphs. 14 ref.

2658 Radioactive Ca^{47}. W. S. Lyon and T. H. Handley. *Physical Review*, v. 100, ser. 2, Dec. 1, 1955, p. 1280-1283.

Investigation involving β-γ coincidence measurements and NaI γ-ray spectrometry to study the decay characteristics. Table, graphs, diagrams. 6 ref.

2659 Protons From the Bombardment of Several Elements With 40-Mev Alpha Particles. R. M. Eisberg, G. Igo, and H. E. Wegner. *Physical Review*, v. 100, ser. 2, Dec. 1, 1955, p. 1309-1314.

Measurement of proton energy distributions of Au, Ag, and Cu. Table, graphs. 18 ref.

2660 Radioactivity of Sc^{44}. J. W. Blue and E. Bleuler. *Physical Review*, v. 100, ser. 2, Dec. 1, 1955, p. 1324-1329.

A reinvestigation of Sc^{44} using a NaI γ-ray spectrometer and a magnetic-lens spectrometer adapted to coincidence measurements. Diagrams, spectra. 30 ref.

2661 Survey of (p,n) Reactions at 12 Mev. H. G. Blosser and T. H. Handley. *Physical Review*, v. 100, ser. 2, Dec. 1, 1955, p. 1340-1344.

Measurements of twenty (p,n) cross sections on elements from atomic numbers 21 to 58. Table, graph. 26 ref.

2662 Three-Body Contributions to the Triton Binding Energy. Ely M. Gelbard. *Physical Review*, v. 100, ser. 2, Dec. 1, 1955, p. 1530-1538.

Binding energy contributed by five three-body terms is computed. Results of this calculation indicate that the so-called "leading" three-body term is not the dominant term, even if damping is taken into account. Tables, graph. 18 ref.

2663* On the Intermediate Coupling Theory of Pseudo-Scalar Meson Field and a Nucleon. Daisuke Ito, Yoneji Miyamoto, and Yukihiko Watanabe. *Progress of Theoretical Physics*, v. 13, June 1955, p. 594-602.

Properties of the proper field around a nucleon are investigated by Tomonaga's theory of intermediate coupling applied to the pseudo-scalar field, and the phase shifts of pion-nucleon scattering and the anamalous magnetic moment of a nucleon are calculated. 9 ref.

2664* Use of Sodium in Heat-Exchangers. Využití sodíku ve výměnících tepla. (Czech.) F. Dubšek. *Strojírenství*, v. 5, no. 11, Nov. 1955, p. 819-824.

Basic physical properties of Na as a heat-exchange medium. Use of Na in nuclear reactors, and its advantages over other coolants. Design of Na heat-exchangers. Graph, tables, diagrams, photographs. 10 ref.

2665* Heavy Unstable Particles (Hyperons and K-Mesons). Tiazhelye nestabil'nye chastitsy (giperony i K-mezony). (Russian.) A. O. Vaisenberg. *Uspekhi fizicheskikh nauk*, v. 57, no. 3, Nov. 1955, p. 361-434.

Cameras and methods of identifying particles in nuclear emulsions. Types of neutral particles. Calculation of average life according to duration of flight. Graphs, diagrams, tables, photographs. 118 ref.

2666* Radioactive Isotopes in Technology. Radioaktivnye izotopy v tekhnike. (Russian.) P. E. D'iachenko. *Vestnik akademii nauk SSSR*, v. 25, no. 10, Oct. 1955, p. 39-47.

Application of isotopes in metallurgy, machine construction, wear of machine parts, corrosion, machining, nondestructive tests, bio-chemistry, and soil science.

2667* Scintillation Counting of (n, Alpha) and (n, f) Reaction for Isotopic Analysis of Lithium, Boron, and Uranium. Szintillationszählung der (n, α)-bzw. (n, f)-Reaktion zur Isotopenanalyse bei Lithium, Bor und Uran. (German.) H. Wänke and E. U. Monse. *Zeitschrift für Naturforschung*, v. 10a, nos. 9-10, Sept.-Oct 1955, p. 667-669.

A method for the relative determination of accumulations of isotopes with application to scintillation counters and Ra-Be preparation. Diagram, tables. 1 ref.

2668* The Branching Ratio of Kr^{85m} From Fission Yield Studies. (English.) A. T. Blades and H. G. Thode. *Zeitschrift für Naturforschung*, v. 10a, no. 11, Nov. 1955, p. 838-840.

The fission yield has been determined both at Kr and Rb with a mass spectrometer using isotope dilution techniques. Diagram. 11 ref.

Books and Miscellaneous Publications

2669 The Theory of Photons and Electrons. J. M. Jauch and F. Rohrlich. Addison-Wesley Series in Advanced Physics. 488 p. 1955. Addison-Wesley Publishing Co., Cambridge, Mass. (QC174.1 J32t)

A unified presentation of radiation theory in full conformity with the principles of relativity and quantum mechanics.

2670 Handbook of New Nuclear Techniques. Jerome D. Luntz, editor. 143 p. Nucleonics, New York. (QC776 H19n)

Techniques in nuclear engineering, instrumentation, chemistry, and physics; medical and biological effects of radiation; uses of radioisotopes.

See also: **1845** (plant uptake of radioactive Sr); **1846** (plant uptake of radioactive iron); **1847** (isotopes in agriculture); **1859** (radiation effects on cells); **1958** (nitrogen isotopes); **2179** (food irradiation); **2182** (food preservation by radiation); **2201** (meteorology and atomic energy); **2703** (ionization measurement in nuclear emulsions); **2746** (radioactive waste disposal); **2754** (handling radioactive substances); **2755** (handling radioactive substances).

OPERATIONS RESEARCH AND MANAGEMENT ENGINEERING

2671 Handling Bulk Materials in Steel Plants. A. H. Andrews. *Iron and Steel Engineer,* v. 32, Dec. 1955, p. 71-82; disc., p. 82-84.

Methods and equipment used to transport and move ore, coal, and similar bulk materials. Photographs.

2672* Evaluation of the Possibilities of Research Effort in a New Field of Technology. (English.) Albert H. Rubenstein. *IVA tidskrift för teknisk-vetenskaplig forskning,* v. 26, no. 6, 1955, p. 239-251.

Discussion of organization policies relating to applied research activity, and the factors involved in the transfer of information. Table, diagrams, graphs.

2673* The Relationship of Nondestructive Testing to Quality Control. William P. Farnsworth. *Nondestructive Testing,* v. 13, Nov.-Dec. 1955, p. 28-30, 34.

Relationship of nondestructive testing to the management function and responsibilities of quality control; some aspects of sampling which can contribute to efficient utilization of test methods.

2674 Quality Control of Investment Castings. Charles Yaker. *Precision Metal Molding,* v. 14, Jan. 1956, p. 47, 79-80.

Eight control requirements which must be agreed upon by buyer and vendor in order to produce aircraft quality investment castings. (To be continued.)

2675 Workshop for Management, Proceedings (Annual Volume), v. 7, 1954, 504 p. Management Magazines, Inc., Book Division, New York. (HD29 Sy87p)

Current developments in the field of management, organization, systems, procedures, and related matters. Diagram, graph, photograph, micrograph, table.

Books and Miscellaneous Publications

2676* Science and Engineering in American Industry. 41 p. 1955. National Science Foundation. Available from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. (TA157 N21sc)

Preliminary report of an industrial survey of scientific research and development for the period 1953-1954. Covers total costs, number of companies conducting research and development, extent of basic research in private industry, scientific fields of research, and number of scientists and engineers employed in research and other activities.

2677 Scientific Personnel Resources. 86 p. 1955. National Science Foundation. Available from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. (TA157 N21s)

Summary of data on supply, utilization, and training of scientists and engineers.

2678 The Challenge of Automation. 77 p. 1955. Public Affairs Press, Washington, D. C. (TJ216 C35c)

Papers delivered at the National Conference on Automation to show the effects on our economy and standards of living and the influence of highly mechanized and automatic equipment in our plants and offices.

See also: **2436** (materials handling at high temperature).

ORE AND MATERIALS BENEFICIATION

2679* Difficult Classification Problems Solved With the Dutch State Mines Cyclone. R. E. Hochscheid. *Chemical, Metallurgical & Mining Society of South Africa, Journal,* v. 56, Nov. 1955, p. 197-204.

Describes four series of laboratory and plant tests. The test should serve as approximate guides to cyclone diameter, feed pressure, and capacity, for other classifications involving viscous feeds or fine separations. Photographs, diagrams, tables. 1 ref.

2680* The Cyclone as a Gold Concentrator. J. H. French. *Chemical, Metallurgical & Mining Society of South Africa, Journal,* v. 56, Nov. 1955, p. 205-211.

The cyclone employs quieter and less turbulent conditions of flow, which allow freer movement of the fine Au particles through the pulp to the concentrate zone. Tables, graphs.

2681* Benefication of Manganese Ores. Ferromanganese Requirements of the National Steelmaking Industry. **El beneficio de los minerales de manganeso. Necesidades de ferromanganeso en la industria siderurgica nacional.** (Spanish.) Bernabé Chavarri. *Institutio del hierro y del acero,* v. 8, no. 38, July- Sept. 1955, p. 384-397.

Thermodynamic interpretation of the MnO reduction by C. Blast- and electric-furnace production of ferromanganese. Graphs, diagram.

2682* Obtaining Sulfur, Iron, and Other Metals From Pyrite. **La obtension de azufre, hierro y demas metales a partir de la pirita.** (Spanish.) Otto Barth. *Institutio del hierro y del acero,* v. 8, no. 38, July-Sept. 1955, p. 406-416.

Describes preparation of pyrite, chemical transformation processes, roasting, sintering, volatization, and other methods. Tables, graph, diagrams.

2683* Studies in the Recovery of Uranium From Carbonate Solutions. I. Precipitation With Caustic Soda. D. V. Bhatnagar and T. K. S. Murthy. *Journal of Scientific & Industrial Research,* v. 14, sec. B, Nov. 1955, p. 572-576.

An investigation of the effect of varying the concentrations of NaOH, $NaCO_3$, U, phosphate and vanadate, and of temperature on the precipitation of U from carbonate solutions. Graphs, table. 7 ref.

2684* Quemont Mill. *Mine & Quarry Engineering,* v. 22, Jan. 1956, p. 16-21.

Description of Au concentrating procedures. Photographs, flowsheet. 1 ref.

2685 Design and Operation of Callow-Type Flotation Cells at Kennecott's Hayden Concentrator. G. P. Sewell. *Mining Engineering,* v. 7, Dec. 1955, p. 1112-1114.

Description of equipment and methods. Diagrams, tables.

2686 Increasing Coal Flotation-Cell Capacities. A Report on Semicommercial-Scale Experiments. B. W. Gandrud and H. L. Riley. *Mining Engineering,* v. 7; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 202, Dec. 1955, p. 1137-1142.

Operating variables and certain factors pertaining to cell design investigated for possible effects on cell capacities. A modified subaeration-type unit cell, 24 x 24-in. cross section, vol. 12 cu. ft. used in experiments. Tables, diagram, photographs. 3 ref.

2687 Fluorochemical Collectors in Flotation. Strathmore R. B. Cooke and Eugene L. Talbot. *Mining Engineering,* v. 7, *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 202, Dec. 1955, p. 1149-1152.

Reagents for nonsulfide ores and for sulfide systems, and contact angle measurements. Tables, graphs. 13 ref.

2688* Pressure Hydrometallurgy. P. M. J. Gray. *Reviews of Pure and Applied Chemistry,* v. 5, Sept. 1955, p. 194-216.

Recent developments in the chemistry and processes of pressure leaching and pressure precipitation. 46 ref.

2689* Engineering Features of Uranium Plant Design. I-II. S. Craib. *South African Mining and Engineering Journal,* v. 66, pt. 2, Nov. 26, 1955, p. 457 + 5 pages; Dec. 3, 1955, p. 511 + 4 pages.

Outlines basic process of extracting U oxide from the Au-bearing reefs of South Africa; describes the major equipment used in corrosion and abrasion protection; estimates capital cost and power consumption. Diagrams, photographs, flowsheet, table.

2690* Intensification of Enrichment of Magnetite Quartzites. **Intensifikatsiia obogashcheniia magnetitovykh kvartsitov.** (Russian.) V. I. Karmazin. *Stal'*, v. 15, no. 11, Nov. 1955, p. 969-976.

Comparative analysis of magnetic separation and flotation, and indices of enrichment; cost of operation. Tables, graphs, diagrams, micrograph. 10 ref.

2691 Concentration Tests of Selected California-Nevada Manganese Ores. A. L. Engel, H. J. Heinen, Edward Morrice, and E. S. Shedd. *U. S. Bureau of Mines, Report of Investigation* 5163, Oct. 1955, 12 p. (TN21 Un3r)

The results indicate possible treatment methods or the limitations of these methods. Only simple treatments were attempted, such as might be feasible for small operations. The information reported is of interest in the present or future development of ores of these types in their respective localities. Tables.

2692 A Study of the Factors Affecting the Efficiency of Carbonate Leaching. C. J. Hoffman, W. I. Watson, and I. F. Schwein. *Western Laboratories Arthur D. Little, Inc. (U. S. Atomic Energy Commission)*, RMO-2617, Mar. 1955, 34 p. (UF767 U3r)

The fineness of ore particle size and maintenance of suitable oxidizing conditions in the leach solution influence the extent of U extraction by a sodium carbonate-sodium bicarbonate leach solution. Graphs, tables. 14 ref.

See also: **2341** (titaniferous slags).

PHYSICS

2693 Vibrational Dynamics With Lenses, Mirrors, and Prisms. John Satterly. *American Journal of Physics*, v. 23, Dec. 1955, p. 562-581.

Calculations of the period of rocking furnish interesting examples of the applications of mechanics to vibrational problems, and the calculation of positions of centers of gravity and values of moments of intertia provide additional exercises. Tables, diagrams.

2694 On Deriving the Formulas for Electromagnetic and Other Forces From the Interaction Energy of the Fields. H. L. Armstrong. *American Journal of Physics*, v. 23, Dec. 1955, p. 582-584.

Treatment of some force and energy relations of electromagnetic theory is given, in which the energy density of the field is postulated as fundamental, and the force relations are derived by transformation of vector integrals. This focuses attention on the fields as the concepts of special interest; the attention to interaction energies of fields offers interesting analogies to the methods used in wave mechanics. 5 ref.

2695 Spin Resonance Line Shape. Jerome I. Kaplan. *American Journal of Physics*, v. 23, Dec. 1955, p. 585-589.

Method is given for the calculation of the spin resonance equations based on solving for the spin vector expectation value subject to several external conditions. The value of the method is limited to the case where the system can be described by one relaxation time. Diagram. 7 ref.

2696 Heat Units and Temperature Scales for Calorimetry. H. F. Stimson. *American Journal of Physics*, v. 23, Dec. 1955, p. 614-622.

Discusses differences between temperature scales nomenclature and definitions of heat unit as redefined by general conference on Weights and Measures. Table, graph. 21 ref.

2697 Ultrasonics—How It Works and What It Does. Alexander Murdoch, Jr. *American Machinist*, v. 100, Jan. 2, 1956, p. 97-104.

Principles of operation, equipment and power necessary, and factors to be considered in developing apparatus suitable for large-scale commercial application. Photographs, micrographs, table, diagram, graphs.

2698* Measuring the Absorption Coefficients of Acoustical Materials by the Reverberation Chamber Method. **Sur la mesure des coefficients d'absorption de matériaux acoustiques par la méthode de la chambre réverbérante.** (French.) Roger Lamoral. *Annales des télécommunications*, v. 10, no. 10, Oct. 1955, p. 206-217.

Method of Sabine; comparison of Sabine, Eyring, and Millington formulas; influence of various parameters on results. Diagrams, tables, graphs. 7 ref.

2699* Luminescence of Crystals at Low Temperatures. Naphthalene at 20 K. **Luminescence de cristaux aux basses températures. Naphtalène a 20° K.** (French.) Adnan Zmerli and Paul Pesteil. *Comptes rendus*, v. 241, no. 15, Oct. 10, 1955, p. 938-940.

Includes tables, graphs. 17 ref.

2700 Properties of Matter at High Pressure. I. D. M. Newitt. *Engineer*, v. 200, Nov. 25, 1955, p. 752-755.

Properties at pressures up to 100,000 atmospheres, with some reference to conditions up to 1,000,000 atmospheres; methods of measuring high pressures; problems in design of high-pressure equipment. Diagrams, photographs, graph. 25 ref. (To be continued.)

2701 Transition Probability in Molecular Encounters. II. Vibrational Relaxation Time in Methane. T. L. Cottrell and N. Ream. *Faraday Society, Transactions*, v. 51, Nov. 1955, p. 1453-1465.

Principle based on calculating the probability of vibration deexcitation for typical encounters between pairs of molecules and averaging over all encounters. Graph, tables. 19 ref.

2702 A General Approach to Hysteresis. IV. An Alternative Formulation of the Domain Model. D. H. Everett. *Faraday Society, Transactions*, v. 51, Nov. 1955, p. 1551-1557.

Compares various approaches to the representation of hysteresis systems in terms of a domain model, and provides a simple method of expressing the equations for scanning curves within a hysteresis loop. Graphs. 8 ref.

2703* Ionization Measurement of Inclined Traces in Nuclear Emulsions. **Ionisationsmessungen an geneigten Spuren in Kernemulsionen.** (German.) H. Winzeler. *Helvetica Physica Acta*, v. 28, nos. 5-6, 1955, p. 497-502.

Discusses a simple interrelation on basis of which, and using the "mean gap-length" method, it is possible to determine the ionization for heavy inclined tracers which is verified by high-energy α-particles. Diagrams. 5 ref.

2704 Theory and Experiments on a Basic Element of a Storage Light Amplifier. J. E. Rosenthal. *I. R. E., Proceedings*, v. 43, Dec. 1955, p. 1882-1888.

Presents a simple theoretical calculation on the operation and performance of the amplifier, comparing its theoretical performance with experimental data, to base on this theory the design of a practical unit. Diagrams, table. 6 ref.

2705 An Electroluminescent Light-Amplifying Picture Panel. B. Kazan and F. H. Nicoll. *I. R. E., Proceedings*, v. 43, Dec. 1955, p. 1888-1897.

An experimental amplifier which uses a photoconductive layer electrically in series with an electroluminescent phosphor layer. Diagrams, photograph, graphs. 3 ref.

2706 Space-Charge Effects in Electron Optical Systems. K. T. Dolder and O. Klemperer. *Journal of Applied Physics*, v. 26, Dec. 1955, p. 1461-1471.

Concludes that a waist and a crossover can coexist in the same beam. Either positive or negative spherical aberration can be produced by space effects in initially convergent beams. Graphs, diagrams, table. 4 ref.

2707 On the Optical Properties of Solids. Herbert B. Rosenstock. *Journal of Chemical Physics*, v. 23, Dec. 1955, p. 2415-2421.

Treatment of the usual linear theory of lattice vibrations in ionic crystals, without the use of the symplifying cyclic boundary conditions, leads to an electric moment associated with each normal frequency which is a quasicontinuous function of the propagation vector. Diagram, table. 20 ref.

2708* Nature of Tensile Rupture. I. J. Gruntfest. *Journal of Polymer Science*, v. 18, Dec. 1955, p. 449-454.

Some cases in which the tensile strength can be directly related to the elastic constants and flow properties and therefore to the dominant local structure of a material. The problem of tensile failure is discussed in terms of the conditions for mechanical stability. Tables. 12 ref.

2709* Change in the Permeability of Diaphragms Under the Effect of Ultrasound. **Hártyák áteresztő képességének megváltozása ultrahang hatására.** (Hungarian.) Gyula Tamás and Tamás Tarnóczy. *Magyar fizikai folyóirat*, v. 3, nos. 5-6, 1955, p. 543-552.

Experiments with cellophane diaphragms and Na oxalate diffusion for establishing the various components of the effect of ultrasound. Diagram, table, graphs. 21 ref.

2710* Some Studies in High Resolution Infrared Spectroscopy. (English.) C. Cumming, R. N. Dixon, and N. Sheppard. *Nuovo cimento (Supplemento)*, v. 2, ser. 10, no. 3, Sept. 1955, p. 564-570.

Ethyl halides, Silyl iodide, and NH_3 spectra are studied. Table. 14 ref.

2711* Thermodynamical Theory of Galvanomagnetic and Thermomagnetic Phenomena. (English.) R. Fieschi. *Nuovo cimento (Supplemento)*, v. 2, ser. 10, no. 4, Sept. 1955, p. 1168-1170.

Mathematical analysis. 4 ref.

2712 Magnetic Susceptibility of Germanium. D. K. Stevens, J. W. Cleland, J. H. Crawford, Jr., and H. C. Schweinler. *Physical Review*, v. 100, ser. 2, Nov. 15, 1955, p. 1084-1093.

Magnetic behavior of a variety of specimens were measured as a function of temperature over the range from 70 to 300 K. Measurements were also made on one n-type specimen bombarded with fast neutrons. Graphs, tables. 34 ref.

2713 Influence of Crystalline Electric Fields on Antiferromagnetic Transitions. L. D. Roberts, R. B. Murray, and J. W. T. Dabbs. *Physical Review*, v. 100, ser. 2, Nov. 15, 1955, p. 1100-1103.

Treatment of Van Vleck is extended to include a crystalline electric field term, through use of the effective spin Hamiltonian. Diagram. 12 ref.

2714 Electroluminescence of Zinc Sulfide Single Crystals. D. R. Frankl. *Physical Review*, v. 100, ser. 2, Nov. 15, 1955, p. 1105-1111.

Quantitative measurements of the electroluminescent emission from synthetic single crystals with Ag paint contacts under 60-cycle half-wave voltage excitation carried out at several temperatures. Diagram, oscillograms, micrographs, graphs. 23 ref.

2715 Soft X-Ray Absorption of Tellurium and Vitreous and Metallic Selenium. M. Parker Givens, Charles J. Koester, and William L. Goffe. *Physical Review*, v. 100, ser. 2, Nov. 15, 1955, p. 1112-1115.

The absorption of metallic Se is compared with that of the vitreous form in the region from 200 A. to 240 A. For these two forms of Se and for Te, the absorption band is separated into two component bands. This has led to a revised estimate of 1.2 e.v. for the separation of the M_{IV} and M_V levels of Se and 1.6 e.v. for the separation of the N_{IV} and N_V levels of Te. Diagrams, table. 9 ref.

2716 Dislocation Energies in NaCl. H. B. Huntington and J. E. Dickey. *Physical Review*, v. 100, ser. 2, Nov. 15, 1955, p. 1117-1128.

Energies for both screw and edge dislocations in rock salt have been investigated. The effect of elastic anisotropy has been incorporated into the contribution from the region outside the core. Detailed calculations have been carried out for the energies of the cores themselves as a function of radius, and joined smoothly to the curves of the elastic theory. The core calculations are based on the Born-Mayer model and employ the formulas of Madelung for the potentials of rows of uniformly spaced charges. Tables, diagrams. 18 ref.

2717* The Quadrupole Moment of La^{139}. (English.) Kiyoshi Murakawa. *Physical Society of Japan, Journal*, v. 10, no. 11, Nov. 1955, p. 927-929.

Hyperfine structure of the spectra of La(I) and La(II) was studied, and the date, together with an improved value of the screeing correction of the *d*-electron, yielded the result that the quadrupole moment of La^{139} is $(0.6 \pm 0.2 \times 10^{-24}$ sq. cm. Tables. 11 ref.

2718* The Mechanism of Internal Friction Due to the Motion of the Dislocation. (English.) Tokutaro Hirone, Nobuhiko Kunitomi, and Masajiro Abe. *Physical Society of Japan, Journal*, v. 10, no. 11, Nov. 1955, p. 960-966.

Studied from the measurement on the variation of internal friction with cold-work. For Cu, internal friction increases with the initial cold-work and decreases after showing a maximum. Diagram, graphs, table. 12 ref.

2719 The Barkhausen Effect. R. S. Tebble. *Physical Society, Proceedings*, v. 68, no. 432B, Dec. 1955, p. 1017-1032.

Critical examination of the elementary processes which are usually considered as responsible for the discontinuous and irreversible domain boundary movements associated with the Barkhausen effect. Diagrams, graphs. 9 ref.

2720 Modification of the Peierls-Nabarro Model for Edge Dislocation Core. H. B. Huntington. *Physical Society, Proceedings*, v. 68, no. 432B, Dec. 1955, p. 1043-1048.

Critical review of various assumptions implicit in the Peierls-Nabarro treatment of the core of an edge dislocation. 5 ref.

2721* Ferromagnetic Domains in Permanent Magnet Materials. L. F. Bates. *Research*, v. 8, Dec. 1955, p. 462-472.

An account is given of the domain concept and its application to ferromagnetic metals. Special attention is given to powder patterns observed on surfaces of *Alnico* and columnar *Alcomax*. Diagrams, photographs, micrographs. 3 ref.

2722* The Indentation of an Orthotropic Half Plane. (English.) Harry Donald Conway. *Zeitschrift für angewandte Mathematik und Physik*, v. 6, no. 5, Sept. 1955, p. 402-405.

Concerned with the contact pressure between a rigid block and a plane. 9 ref.

2723* Activation of CdS Crystals. **Die Aktivierung von *CdS*-Kristallen.** (German.) Klaus-Thomas Wilke. *Zeitschrift für physikalische Chemie (Leipzig)*, v. 205, nos. 1-2, Oct. 1955, p. 73-77.

Activation of CdS crystals by the addition of activators, such as Ag_2S, Cu_2S, and As_2S_2, to the CdS powder. Tables. 4 ref.

Books and Miscellaneous Publications

2724 Principles and Problems in Energetics. J. N. Brønsted. (Translated from the Danish by R. P. Bell.) 119 p. 1955. Interscience Publishers, New York. (QC311 B78p)

Develops an entirely new system for presenting the concepts and principles of thermodynamics so that they embrace the energetic transformations of all types of macroscopic processes in a more symmetrical and uniform manner.

2725 The Elements of Probability Theory and Some of Its Applications. Harald Cramér. (Translated and revised from the Swedish.) 281 p. 1955. John Wiley & Sons, New York. (QA273 C84e)

Develops a mathematical model for the description and interpretation of phenomena showing statistical regularity, and shows how this model can be used for the drawing of valid inferences from statistical data.

2726 Ultrasonic Engineering With Particular Reference to High Power Applications. Alan E. Crawford. 344 p. 1955. Academic Press, New York.

Theory, methods of generation, and applications with particular reference to metallurgical uses.

2727 Topological Transformation Groups. Deane Montgomery and Leo Zippin. Interscience Tracts in Pure and Applied Mathematics No. 1. 282 p. 1955. Interscience Publishers, New York. (QA611 M76t)

Recent developments in knowledge of the structure of locally compact groups, together with a review of previous knowledge.

2728 Measurement and Calculation in Physics. **Messen und Rechnen in der Physik.** (German.) Ulrich Stille. 416 p. 1955. Friedr. Vieweg & Sohn, Braunschweig, Germany. (QC21 St54m)

A collection of formulistic and symbolic expressions of magnitudes and units in all branches of physics, with definitions, equations, and examples; standardization of their use and a reasoned synthesis.

2729 The Method of Trigonometrical Sume in the Theory of Numbers. I. M. Vinogradov. (Translated and revised from the Russian by K. F. Roth and Anne Daveport.) 180 p. 1947. Interscience Publishers, New York. (QA241 V77m)

A transformation of the analytic theory of numbers, with Vinogradov expounding his method and its application.

2730 Magnets and Magnetic Measuring Techniques. R. K. Wakerling and A. Guthrie, editors. 213 p. 1949. Office of Technical Services, Dept. of Commerce, Washington 25, D. C. (QC757 Un3.1m)

Four papers on design requirements, instruments, performance of model magnets, and tests on fall-scale magnets.

See also: **2449** (electrical anistropy of Ga).

PLASTICS

2731* Preparation and Properties of β-Hydroxyethyl Derivatives of Polyvinyl Alcohol (β-Hydroxyethyl Polyvinyls). **Préparation et propriétés de dérivés β-hydroxyéthylés de l'alcool polyvinylique (β-hydroxyéthyloxypolyvinyles).** (French.) Georges Champetier and Michel Lagache. *Comptes rendus,* v. 241, no. 17, Oct. 24, 1955, p. 1135-1137.

3 ref.

2732 The Spectrophotometric Analysis of Copolymers of Styrene and *p*-Methoxystyrene. H. W. Melville and L. Valentine. *Faraday Society, Transactions,* v. 51, Nov. 1955, p. 1474-1478.

Experimental data. Graphs, tables. 10 ref.

2733 German Developments in Applications of P.V.C. M. S. Welling. *Industrial Chemist and Chemical Manufacturing,* v. 31, Dec. 1955, p. 614-617.

Describes exhibits shown at recent Plastics Exhibition in Dusseldorf, among them, exhaust fans and entire exhaust systems fabricated in rigid PVC. Of special interest was flame spraying gun for applying PVC paste to all types of surfaces. Photographs.

2734 The Role of Mercaptans in Polymerization of Dienes and the Copolymerization of Styrene and Dienes. M. S. Kharasch, Walter Nudenberg, and Fred Kawahara. *Journal of Organic Chemistry,* v. 20, Nov. 1955, p. 1550-1564.

The reactions of mercaptans with styrene and butadiene in the presence of an oxidant at 5 and 30 C have been investigated. Synthetic routes for the preparation of a number of new compounds are described. Tables. 7 ref.

2735* Some Applications of Plastics in Mechanical Handling Plant. *Mechanical World and Engineering Record,* v. 135, Dec. 1955, p. 541-543.

Uses for the growing range of compounds possessing the optimum combinations of properties. Photographs.

2736 Plating on Plastics. Harold Narcus. *Metal Finishing (Guidebook—Directory Ed.),* 1956, p. 380-385. (T13 M56f)

Chemical reduction, mirror spray, and metal evaporation methods. 16 ref.

2737 The Year 1955 in Review. *Modern Plastics,* v. 33, Jan. 1956, p. 135 + 14 pages.

Survey of events throughout the entire plastics industry, with extensive references to the literature. Table, photographs. 498 ref.

2738* Stabilizers for Vinyl Chloride and Its Copolymers. II. Matthew Perry and Paul F. Bruins. *Plastics Technology,* v. 1, Dec. 1955, p. 673-681, 684.

Comprehensive information on the features, properties, and applications of many types and classes of vinyl stabilizers; subdivided under heavy metal soaps, chelaters, and epoxides. Photograph, tables. 20 ref.

2739 Technical and Management Conference, Reinforced Plastics Division, Proceedings, (Annual Volume), v. 10, 1955. Sections individually paged. Society of the Plastics Industry, Ridgewood, N. J. (TP986 So13p)

Comprehensive review of advances made in all phases of the plastics industry with particular reference to evolution of reinforced plastics in the aircraft industry. Tables, graphs, maps, diagrams, photographs.

2740 Sorption and Orientation Properties of Macromolecules. John W. Rowen and Hyla Cook. *University of California, Los Angeles Campus, School of Medicine (U. S. Atomic Energy Commission),* UCLA-347, Oct. 1955, 37 p. (UF767 Un3.1uc)

The isothermal sorption relationship is useful in calculating the number of sites which may accompany hysteresis. The second relationship is used in the characterization of asymmetric molecules. Tables, graphs. 45 ref.

2741* Aging of High Polymers. ***Starenie vysokopolimerov.*** (Russian.) A. S. Kuz'minskii. *Uspekhi khimii,* v. 24, no. 7, 1955, p. 842-874.

Structure and reactivity of various polymers. Relations between mol. wt., non-saturation, polar substitutes, and reactivity. Thermal aging. Graphs, tables. 91 ref.

2742 Accelerated Heat Aging of Polyethylene. S. P. Foster and W. W. Spohn. *Wire and Wire Products,* v. 30, Dec. 1955, p. 1487-1489, 1532.

Recent studies show accelerated heat aging improves polyethylene compounds for wire and cable by increasing the crystalline content. Graphs, tables. 4 ref.

2743 Recent Developments in Polyethylene Insulating Materials. R. J. Lurie and J. A. Snyder. *Wire and Wire Products,* v. 30, Dec. 1955, p. 1497-1499, 1533-1534.

Discusses properties and possible applications of several new polymers. Tables, graphs.

2744 Polymerization of Ethylene Initiated by Gamma Radiation. James C. Hayward, Jr. *Yale University, School of Engineering (U. S. Atomic Energy Commission),* NYO-3313, June 1955, 212 p. (UF767 U3ny)

Initial rates of the polymerization of ethylene, initiated by γ radiation, have been derived from total pressure measurements on batch systems of ethylene. A simplified version of a free-radical polymerization mechanism is presented. Tables, graphs, diagrams. 129 ref.

See also: **2257** (use of plastics in bearings); **2768** (plastic film testing).

POLLUTION AND WASTES

2745 Deep-Well Disposal of Chemical Wastes. H. O. Henkel. *Chemical Engineering Progress,* v. 51, Dec. 1955, p. 551-554.

Disposing of brine wastes containing dissolved metallic salts and organics, by pouring it at a rate 100 to 150 gal. per min. into deep wells. Photographs, diagrams, graph.

2746 Disposal of Radioactive Waste. I. The U. S. Approach. II. The British Approach. Bernard Manowitz and Leo Walter. *Consulting Engineer,* v. 6, Dec. 1955, p. 36-44, 84.

The U. S. and the British approaches to separation plants, liquid waste disposal, volume reduction, gaseous and solid waste, water pollution, and biological treatment. Photographs, tables, diagrams. 14 ref.

2747 The Removal of Aerosols. I. I. J. Smith. *Industrial Chemist and Chemical Manufacturer,* v. 31, Dec. 1955, p. 602-606.

Discusses principle, design, efficiency, and performance data on cyclone separators and electrostatic precipitators. Tables. 15 ref. (To be continued.)

2748 Cleaning of Open Hearth Stack Gases. Leslie Silverman. *Industrial Heating,* v. 22, Dec. 15, 1955, p. 2506 + 4 pages.

Reports on cleaning methods combining agglomeration of particles and compact filtration. Table. (To be continued.)

2749 Evaluation of a Waste Pickle Liquor Treatment. T. F. Barnhart. *Iron and Steel Engineer*, v. 32, Dec. 1955, p. 62-65.

New process permits recovery of inhibitors, and of the liquor as reusable sulfuric acid; and allows use of its only by-product, iron oxide, by the steel plants. Tables, diagrams.

2750 Wet and Dry Filtration Studies—Electric Furnace Ferrosilicon Fume Collection. Leslie Silverman and Robert A. Davidson. *Journal of Metals*, v. 7; *American Institute of Mining and Metallurgical Engineers, Tranactions*, v. 203, Dec. 1955, p. 1327-1335.

Determines stack concentrations and volumes of material evolved; physical and chemical nature of the collected fume. Describes wet and dry collector studies undertaken to recover the fume. Diagrams, tables. 4 ref.

2751 Mechanical Exhaust for Plating Rooms. B. F. Postman. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 25 + 11 pages. (T13 M56f)

General specifications for exhaust systems used in different plating room processes, and considers exhaust system constituents. Diagram, graph.

2752 Control and Treatment of Metal Finishing Wastes. J. C. Hesler. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 101 + 9 pages. (T13 M56f)

Preliminary considerations of material conservation and design. Specific treatments of Cr, cyanide, acid, and alkali wastes, oily emulsions, and mixed wastes are presented.

2753 Activated Carbon Treatment of Plating Solutions. Walter A. Helbig. *Metal Finishing (Guidebook–Directory Ed.)*, 1956, p. 396-399. (T13 M56f)

Uses of continuous and periodical C treatment.

2754 Removal of Radioactivity From Laundry Wastes by Trickling Filters. William E. Dobbins, Gail P. Edwards, and Wladimir Gulevich. *New York University, College of Engineering (U. S. Atomic Energy Commission)*, NYO-4641, Final Report, May 1955, 47 p. (UF767 U3ny)

Radioactive laundry waste containing fission products treated continuously on single and two-stage trickling filters. About 90% of the gross activity of mixed fission products can be removed at organic loading of 250 lb. B.O.D. per acre ft. day. The percentage removal decreased with increase in loading. Photograph, tables, graphs.

2755 Diban—Ion Exchange Waste Disposal Scheme. I. I. R. Higgins and R. G. Wymer. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-1984, Nov. 1955, 17 p. (UF767 U3o)

Scheme, based on experimental work, is proposed for decontaminating radioactive wastes whose chief ingredients are Al nitrate and nitric acid. Fission products can be eluted from the column, concentrated into a small volume of highly radioactive waste, and stored with all necessary precautions. Tables, graphs. 24 ref.

2756 Magnetic Susceptibility of Sodium Metal. Raymond Bowers. *Physical Review*, v. 100, ser. 2, Nov. 15, 1955, p. 1141-1144.

Total susceptibility is measured from room temperature down to 55 K using the Gouy technique. Account is given of experimental difficulties which were encountered in an attempt to measure the susceptibility at liquid He temperatures. Diagram, tables. 16 ref.

2757* Particle-Size Distribution of Ground Garbage. E. Robert Baumann, Darell A. Dorman, and Marvin T. Skodje. *Sewage and Industrial Wastes*, v. 27, Nov. 1955, p. 1245-1252.

Verification of the proposed method; test results; particle size distribution codes. Tables, graphs.

2758* Treatment of Acid Wastes With Calcite. Vincent de P. Lukas. *Sewage and Industrial Wastes*, v. 27, Nov. 1955, p. 1253-1258.

Design data; tank types used; description of limestone beds; analytical data; operating costs. Photographs, diagram, tables. 3 ref.

2759* Treatment of Anodizing Wastes by Ion Exchange. Lacern M. Corcoran. *Sewage and Industrial Wastes*, v. 27, Nov. 1955, p. 1259-1261.

Treatment by chemical and ion exchange methods. Ion exchange is more economical. Includes rinse water system. Photograph, table.

2760 The Abatement of Kraft Pulp Mill Odors by Burning. G. G. DeHaas and G. A. Hansen. *Tappi*, v. 38, Dec. 1955, p. 732-738.

Reviews main sources of odors and atmospheric S losses. Describes recovery systems for elimination of major losses and particularly an installation to destroy odors connected with digester and blow-gas system. Diagrams, tables, photographs. 15 ref.

2761 Chemical and Biochemical Effluent Purification. Eduard Farber and Donald V. Robertson. *Tappi*, v. 38, Dec. 1955, p. 750-753.

Recent developments in water purification. Four methods which may help in solving pulping waste liquor problem are: desalting of sea water, mutual precipitation of different effluents, precipitation by heating, and biochemical treatment. Maps. 19 ref.

See also: **1849** (use of sewage sludge).

RUBBER AND ELASTOMERS

2762 The Polymerization of Vinyl Monomers in Natural Rubber Latex. George F. Bloomfield and P. McL. Swift. *Journal of Applied Chemistry*, v. 5, Nov. 1955, p. 609-615.

Practical methods are described for polymerizing methacrylic esters, styrene, and other vinyl monomers in natural rubber latex. Tables, micrographs. 18 ref.

2763* The Vulcanization of Highly Elastic Polymers. **Zur Kenntnis der Vulkanisation hochelastischer Polymerisate. VI.** The Vulcanization of Natural Rubber by Dibenzoylperoxide. **Die Vulkanisation des Naturkautschuks durch Dibenzoylperoxyd.** (German.) Otto Lorenz and Walter Scheele. *Kautschuk und Gummi*, v. 8, no. 11, Nov. 1955, p. 273WT-280WT.

Investigated from 50 to 110 C. Results of the analysis and its kinetics. Tables, graphs. 10 ref.

2764 Effect of Temperature on the Air Permeability of Silicone Rubber. John B. Gregory. *Rubber World*, v. 133, Dec. 1955, p. 389-392.

The permeability to air of several silicone rubber compounds at 75 and 158 F compared with that of natural and butyl rubbers has been determined by a simplified apparatus. Diagram, tables. 10 ref.

SPACE HEATING AND CONDITIONING

2765* Acoustical Ceiling Air Distribution Provides Precise Temperature Control. *Heating & Air Conditioning Contractor*, v. 47, Dec. 1955, p. 32-35.

Includes photographs, diagram.

TEXTILES AND FIBERS

2766* The Solvent Scouring of Grease Wool. I. Review. Daniel P. Norman and W. W. A. Johnson. *American Dyestuff Reporter*, v. 44, Dec. 19, 1955, p. 893-900, 911.

Reviews principles and practices in the light of present knowledge of solvent extraction as an engineering process. Defines and illustrates general terms and operations common to all solvent extraction systems, and describes in detail problems peculiar to wool scouring. Diagrams, tables. 19 ref.

2767* The Rapid Determination of Paper Moisture Contents. J. J. Hamrick, Jr. *ASTM Bulletin*, 1955, no. 210, Dec., p. 39-43.

Tests made on accounting cards to determine typical card moisture contents when exposed to high humidity conditions in business offices. Data obtained will permit operation of environmental chamber that will produce moisture contents representative of these conditions. Tables, photograph, graphs.

2768* Evaluation of the Boor-Quartermaster Snag Tester for Coated Fabrics and Plastic Films. Frank W. Reinhart, Catherine Brown, Ladislav Boor, and John J. Lamb. *ASTM Bulletin*, 1955, no. 210, Dec., p. 50-59.

Reports investigation by National Bureau of Standards on instrument designed to determine snag resistance of fabrics. Factors considered are angle of elevation at which a needle on a pendulum will snag a specimen of material, type of tear, and also energy to tear. Tables, graphs, photographs, diagram.

2769 Industrial Textile Fibers. Theodore B. Merrill, Jr. *Materials & Methods*, v. 42, Dec. 1955, p. 119-134.

Engineering approach to the selection of, and designing with, fibers. It covers the characteristics, properties and uses of natural, mineral, inorganic, and man-made fibers. Photographs, tables.

2770 Man-Made Fibers Data Sheets. XI Polyacrylonitrile Fibers. Paul-A. Koch. *Modern Textiles Magazine*, v. 37, Jan. 1956, p. 46 + 5 pages.

Organized presentation of definitions, product names, inventors, development, starting materials, manufacturing methods, chemical constitution, applications, and patents. Graphs, micrographs, table, X-ray diffraction pattern. 105 ref.

2771 Solvent-Soluble Dyestuffs and Their Uses in the Surface-Coating Industries. J. K. Fishpool. *Paint Technology*, v. 19, Nov. 1955, 371-374, 381.

Reviews properties and applications of various dyestuffs now available, grouping them as water-insoluble, water-soluble basic, and water-soluble acid. Tables. (To be continued.)

WELDING AND JOINING

2772 Spotwelding in the Handley Page Herald. *Aircraft Production*, v. 18, Jan. 1956, p. 18-27.

Presents manufacturing techniques developed for attaching components of primary structure. Diagrams, graphs, micrographs, photographs, tables.

2773 How to Use Fluxes and Solders for Good Joints. W. P. McQuillan. *American Machinist*, v. 100, Jan. 2, 1956, p. 81-84.

Discusses corrosive and noncorrosive fluxes, solder alloy composition, effects of residual flux, means for removing flux, joint strength versus temperature, and other details. Graphs, micrographs, table.

2774 Inert Gas Welding of Aluminum Alloys. II. M. J. Waite. *Canadian Metals*, v. 18, Dec. 1955, p. 44, 46-48.

Discusses welding procedures, properties of weldments, quality control, economic considerations, applications in transportation, chemical, and electrical industries, also in pressure vessels and machinery. Photographs.

2775* Argon Arc Welding. **Soldadura por arco protegido con argon.** (Spanish.) Alfredo Sarriá. *Ciencia y técnica de la soldadura*, v. 5, no. 26, Sept.-Oct. 1955, 10 p.

Describes various methods; advantages and disadvantages of each. Tables, photographs, diagram.

2776* The Development of Some Special Welding Processes. **Contribucion al desarrollo de algunos procedimientos especiales de soldadura.** (Spanish.) W. Hofmann. *Ciencia y técnica de la soldadura*, v. 5, no. 26, Sept.-Oct. 1955, 6 p.

Recent results from cold pressure welding of steel, diffusion bonding, welding of pins, and flow welding. Diagrams, graphs, photograph, micrographs.

2777* Joining of Aluminum Cables With Steel Core by an Aluminothermal Process. **Union de cables de aluminio con alma de acero por procedimiento aluminotermico.** (Spanish.) R. Mearin Domezáin. *Ciencia y técnica de la soldadura*, v. 5, no. 26, Sept.-Oct. 1955, 5 p.

Describes a process of welding Al cables by electrical conduction. Diagram, photographs.

2778* Toxic Gases and Vapors in Welding. **Gases y vapores toxicos en la soldadura.** (Spanish.) J. Dantin Gallego. *Ciencia y técnica de la soldadura*, v. 5, no. 26, Sept.-Oct. 1955, 4 p.

Study of different gases to which the welder may be exposed and the effect of different concentrations on the body. Tables, diagram. 23 ref.

2779* Automatic Pressure Butt-Welding Process for High Pressure Pipe Lines. *Engineer*, v. 200, Dec. 23, 1955, p. 913-914.

A gas welding process in which the desired pressure is developed automatically by making use of the plasticity of the steel that is being welded to control the welding cycle. Diagram, micrograph, photographs.

2780 Joint Design for Joining Tubes to Tube Sheets for Corrosive Radioactive Chemical Service. W. R. Smith. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-37983, Aug. 1955, p. 4-18.

Joints have been developed which are suitable for cases where either the corrosive solution is in contact with the inside or the outside of the tubes. These joints can be produced economically with minimum skills, and can be consistently reproduced with a high degree of integrity and reliability. Diagrams, photographs, tables.

2781* The Significance of Contact Angle Measurements in Soldering. N.R. Srinivasan and H. S. Aswath. *Indian Institute of Science, Journal*, v. 37, sec. B, Oct. 1955, p. 293-303.

A critical review of contact angles in soldering, spreading power of a solder over a metallic surface, and various fluxes used. Diagram, tables. 44 ref.

2782 New Flux Simplifies Brazing of Chrome Carbide. *Iron Age*, v. 176, Dec. 22, 1955, p. 82.

Brazing of sintered Cr carbide in air, without special equipment, is now economically practicable with a flux containing powdered B. Photograph.

2783 How to Get Better Welds in a Weldable Steel. H. S. Davis. *Iron Age*, v. 177, Jan. 19, 1956, p. 70-71.

Methods of welding Carilloy, a low C quenched and tempered constructional alloy plate steel. Tests show that welding does not affect tensile properties, improves hardness and toughness. Photographs.

2784 Materials Engineering File Facts. Standard Brazing Filler Metals. *Materials & Methods*, v. 42, Dec. 1955, p. 137, 139.

Classification, composition, properties, forms, and uses of Al, Cu, Ag, Mg, and Au brazing alloys.

2785 New Epoxy Adhesive. Bernard Gould. *Materials & Methods*, v. 42, Dec. 1955, p. 140, 142.

A one-component thixotropic formulation is applicable to production metal bonding. Table, photographs.

2786 Weldability. J. F. Mercer. *Metal Industry*, v. 87, Dec. 2, 1955, p. 471-472.

Discusses some of the factors involved and describes tests employed to determine weldability of metals in general. 1 ref.

2787 High-Temperature Furnace Brazing. D. M. Dovey and K. C. Randle. *Metal Treatment and Drop Forging*, v. 22, Dec. 1955, p. 501-505.

Brazing method without a flux is based on the use of a controlled atmosphere. Micrographs, photographs, tables. 5 ref.

2788* Mechanized Welding Makes Aero-Engines. I. F. G. C. Sandiford. *Metalworking Production*, v. 99, Dec. 2, 1955, p. 2041-2045.

Reviews methods of fusion and resistance welding. Describes and illustrates machines now in use. Photographs, diagrams.

2789* Mechanized Welding Goes Ahead in Aero-Engine Production. F. G. C. Sandiford. *Metalworking Production*, v. 99, Dec. 9, 1955, p. 2084-2089.

Discusses machines which were built to meet problems of handling large and accurate assemblies in heat-resisting materials used in gas-turbine and similar propulsion units for aircraft. Photographs, diagrams.

2790* **An Analysis of the Behaviour of Riveted Joints in Aluminium Alloy Ships' Plating.** A. R. Flint. *North East Coast Institution of Engineers & Shipbuilders, Transactions*, v. 72, Dec. 1955, p. 83-122.

Elastic behavior, strength, and watertightness were tested. Tables, graphs, diagrams. 18 ref.

2791* Autogenous Methods Using Gas. Welding and Brazing. Cutting. Surface Treatments. Heat Treatment. **Procédés autogènes aux gaz. Soudage et brasage. Découpage. Traitements de surface. Traitements de chauffe.** (French.) H. von Hofe and H. Killing. *Revue de la soudure (Brussels)*, v. 11, no. 3, 1955, p. 126-136.

Optimum conditions of operation and fields of application. Tables, diagrams, photographs.

2792* Resistance-Welding Electrodes of Beryllium-Copper With Silver Additions. **Widerstandsschweiss elektroden aus Berylliumkupfer mit Silberzusatz.** (German.) Theodor Fuchs. *Schweisstechnik*, v. 9, no. 9, Sept. 1955, p. 106-108.

Physical and chemical properties of the electrodes and their practical application. Photographs.

2793* **New Adhesives for Metal Structures.** George J. Baumbach, Jr. *Sperry Engineering Review*, v. 8, Nov.-Dec. 1955, p. 17-21.

Use and bonding properties of new adhesives, and their industrial potential in the metal structures field. Diagram, tables. 4 ref.

2794* Effect of Flame Smoothing on the Properties of Steels. **Vliv rovnání plamenem na vlastnosti ocelí.** (Czech.) A. Strachota. *Strojírenská výroba*, v. 3, no. 7, July 1955, p. 293-295.

Effects of flame smoothing of welds and heating during welding of sheet steel. Explanations of recrystallization and structural changes during cooling. Graphs, table.

2795* Introduction to Automatic Welding Under Flux. **Zavádění automatického svařování pod tavidlem.** (Czech.) J. Lukášek. (Czech.) *Strojírenská výroba*, v. 3, no. 10, Oct. 1955, p. 395-401.

Comparison of various operational techniques; types of welds possible; descriptions of automatic welding machines used. Photographs, tables, diagrams.

2796* Full Utilization of Welding Technology. **O plné využití technologie svařování.** (Czech.) R. Krňák. *Strojírenská výroba*, v. 3, no. 10, Oct. 1955, p. 401-404.

Discusses situations where welded parts can be used instead of cast parts. Comparative cost figures. Graphs, tables, photographs, diagram. 4 ref.

2797* Preheating When Welding Steels Under High-Temperature and High-Pressure Conditions. **Předehřívání při svařování oceli pro vysoké teploty a tlaky.** (Czech.) J. Vrtěl. *Strojírenství*, v. 5, no. 7, July 1955, p. 518-525.

Factors affecting crack formation include hardenability, austenitic and bainitic transformations, thermal cycle of welding, stresses from shrinking during cooling, and H content. Graphs, tables, micrographs. 10 ref.

2798* Progress in Welding Techniques and Technology. **Za novyi pod'em v tekhnike i tekhnologii avarki.** (Russian.) *Svarochnoe proizvodstvo*, 1955, no. 11, Nov., p. 1-2.

Surveys Russian accomplishments, new methods, suggested lines of advancement and improvements, and an indication of certain hindrances and shortages of O,CaC_2.

2799* Further Developments of Automatic Welding. **Za dal'neishee razvitie avtomaticheskoi svarki.** (Russian.) B. E. Paton. *Svarochnoe proizvodstvo*, 1955, no. 11, Nov., p. 3-8.

Operation and applications of the up-to-date Russian welding machines and devices, including mobile welding units for semi-submerged arc welding of thick-sheet Al and its alloys. Photographs, diagrams.

2800* Causes for the Formation of Pores During Electric Arc Welding of Silumin. **O prichinakh obrazovaniia por pri dugovoi svarke silumina.** (Russian.) Iu. E. Gnedovskii. *Svarochnoe proizvodstvo*, 1955, no. 11, Nov., p. 13-15.

Factors affecting and recommendations for avoiding porosity. Graphs, micrographs, diagram. 1 ref.

2801* Welding at the Bryansk Locomotive Construction Works. **Svarka na Brianskom parovozostroitel'nom zavode.** (Russian.) Z. L. Klimovitskii. *Svarochnoe proizvodstvo*, 1955, no. 11, Nov., p. 16-19.

Design and operation of automatic equipment in use, and the various types of welding employed. Diagrams, table, photographs.

2802* Welding of Steel 1Kh18N9T in Atmosphere of Protective Gases With Formation of Root of Butt Welds Without Back-Up Blocks. **Svarka stali 1Kh18N9T v atmosfere zashchitnykh gazov s formirovaniem kornia stykovykh shvov bez podkladok.** (Russian.) M. D. Tiul'kov. *Svarochnoe proizvodstvo*, 1955, no. 11, Nov., p. 20-22.

Electrical conditions for A or He shielded non-consumable W electrode welding of straight or curved pieces. Tables, diagrams, photographs.

2803 A History of the Coated Electrode. John J. Chyle. *Welding Engineer*, v. 41, Jan. 1956, p. 25-27.

Changes that have been made in welding tools during the past 30 yr. Photographs.

2804 Welding Positioners Set the Stage for Weld Quality and Greater Speeds. Ernest L. Richmond. *Welding Engineer*, v. 41, Jan. 1956, p. 33-36.

Salient points to be considered in the selection and application of positioning equipment, which may be identified as welding or work positioners, head- and tail-stocks, and turning rolls. Photographs, diagrams.

2805 The How and Why of Adhesive Bonding. I. Samuel N. Muchnick. *Welding Engineer*, v. 41, Jan. 1956, p. 42, 44.

A review of the conditions for adhesive bonding. Photographs, graph. (To be continued.)

2806 Miles of Piping Are Tig Welded. Morris P. Rosen. *Welding Engineer*, v. 41, Jan. 1956, p. 46, 48.

Phases involved in the country's welding of one of largest stainless steel piping networks. Photographs.

2807 Inert-Gas Metal-Arc Process Applied to the Welding of Stainless Steel. C. Lewis Railton. *Welding and Metal Fabrication*, v. 23, Dec. 1955, p. 455-464.

Discusses porosity, effect of feed speed and current on the arc, butt, and fillet welds; welding conditions for each mechanical testing of welds. Micrographs, diagrams, tables, photographs. 4 ref.

2808 Refrigeration Equipment Assemblies. Application of Special Resistance Welding Plant. N. Maylin. *Welding and Metal Fabrication*, v. 23, Dec. 1955, p. 472-474.

Plant and technique problems encountered in applying resistance welding to production of refrigeration equipment. Special welding equipment is described and illustrated. Photographs, diagrams.

2809 Distortion in Welding. I. Electric Arc Welding. W. T. Amison. *Welding and Metal Fabrication*, v. 23, Dec. 1955, p. 475-477.

Techniques intended to minimize distortion; summarizes various methods by a series of rules. Diagrams. (To be continued.)

2810 How to Weld High-Pressure Vessels With Automatics. Wilmer W. Weber. *Welding Journal*, v. 34, Dec. 1955, p. 1161-1166.

Experience proves submerged arc automatics reduces costs, improves working conditions, and increases production and quality. Recommendations are made for its application to pressure vessel welding, since it meets all code requirements. Photographs.

2811 Electrode Activation for Inert-Gas-Shielded Metal-Arc Welding. A. Lesnewich. *Welding Journal*, v. 34, Dec. 1955, p. 1167-1178.

Use of extremely dilute, invisible coatings of the alkali, alkaline earth and rare earth elements, or certain oxides, to electrodes stabilizes metal transfer and modifies the deposition rate, penetration, and size and shape of the weld bead. Application of the coatings is extended to all industrial metals. Photographs, graphs, tables. 17 ref.

2812 Manual-Arc Welding of Butt Joints in Crane Rails. Ivan Kutuchief. *Welding Journal*, v. 34, Dec. 1955, p. 1179-1184.

Wear and deformation on rail ends are corrected by use of covered metal-arc electrodes. Photographs, table, diagrams. 1 ref.

2813 Engineering Aspects of Inert-Gas Tungsten-Arc Welding of Piping. Helmut Thielsch and C. S. Pulliam. *Welding Journal*, v. 34, Dec. 1955, p. 1185-1195.

Effects of joint design and purging; root-pass cracking; limitations of inspection techniques; advantages of consumable welding insert rings. Photographs, diagrams, micrographs, tables, graph, X-ray radiograms. 3 ref.

2814 Mechanical Properties of Modified Type 347 Weld Metals. *Welding Journal*, v. 34, Dec. 1955, p. 583S-595S.

Evaluates ability of the electrodes to meet standard fabrication codes, and determines tensile and notch impact properties before and after exposure to elevated temperatures. Diagrams, tables, micrographs, graphs. 10 ref.

2815 Measurement of Shunting Currents in Series Spot Welding 0.036-in Steel. E. F. Nippes, W. F. Savage, and S. M. Robelotto. *Welding Journal*, v. 34, Dec. 1955, p. 618S-624S.

Effects of spot spacing, electrode and backing bar geometries, material preparation and electride force on the size and distribution of shunt currents. Tables, photograph, diagrams, graphs. 8 ref.

2816* Welding in the Vacuum Industry. **Zváranie vo vákuovej technike.** (Slovak.) Werner Espe. *Zváranie*, v. 4, no. 7, July 1955, p. 196-207.

Electric-resistance, and cold-, arc-, and flame welding methods used in the construction of high-vacuum and gas-filled electron tubes. Conditions demand the use of gerat amounts of H and rare gases and eliminates use of fluxes. Photographs, tables, graph, diagrams. 50 ref.

2817* Basic Principles of Heat Propagation in the Welded Joint. **Základy teórie šírenia sa tepla v okolí zvaru.** (Slovak.) Andrej Havalda. *Zváranie*, v. 4, no. 7, July 1955, p. 215-218.

Characteristics of the electric arc as a source of heat; calculation of heat in a certain point of a stationary field. Graphs. 3 ref.

WOOD AND FOREST PRODUCTS

2818* Chemical Recovery From Sulphite Waste Liquor by Pyrolysis. I. The Batch Fluidized Pyrolysis of Dried Liquor. W. Rabinovitch and W. H. Gauvin. *Pulp and Paper Magazine of Canada*, v. 56, Dec. 1955, p. 118-124.

An investigation to deterimne the feasibility of applying the fluidized solids technique to the pyrolysis of spray-dried powders obtained from waste sulfite liquors. Diagram, tables, graphs. 21 ref.

2819 Gas Adsorption by Wood, Pulp, and Paper. II. The Application of Gas Adsorption Techniques to the Study of the Area and Structure of Pulps and the Unbonded and Bonded Area of Paper. William R. Haselton. *Tappi*, v. 38, Dec. 1955, p. 716-723.

Nitrogen adsorption data used to study area and pore volume distribution and the effect of adsorbed moisture on the internal area accessible to gas. Micrographs, graphs. 31 ref.

2820 Optical Measurement of Bond Breaking During a Tensile Test. Lars Nordman, Charley Gustafsson, and Göran Olofsson. *Tappi*, v. 38, Dec. 1955, p. 724-727.

Investigation by optical methods, of the hypothesis that bonds are broken in a strip of paper subjected to straining at prerupture loads. Photograph, graphs. 5 ref.

2821 A Method and an Apparatus for Evaluation of the Creasing and Bending Properties of Paperboard. (English.) Jaakko Paronen. *Teollisuuden keskuslaboratorion tiedonantoja* 139, 1955, 5 p. (Reprinted from *Paper and Timber*, 1954, no. 12.) (TS1080 C33m)

A male rule and a female die are used to crease paperboard. Creasing depth is increased in steps and the samples are folded 180° after each creasing to inspect the folds. The smallest and greatest depth between which a faultless fold is obtainable can thus be determined. Photographs, graph. 15 ref.

See also: **2760** (elimination of pulp mill odors).